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Draft Environmental Impact Statement for Extension of F-Line Streetcar Service to Fort Mason Center

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Draft Environmental Impact Statement
Extension of F-Line Streetcar Service to Fort Mason Center

GOLDEN GATE NATIONAL RECREATION AREA, SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK, CALIFORNIA

Lead Agency: National Park Service, U.S. Department of Interior
Cooperating Agencies: San Francisco Municipal Transportation Agency, Federal Transit Administration

The *Environmental Impact Statement for the Extension of F-Line Streetcar Service to Fort Mason Center* would lengthen the historic streetcar F-line from Fisherman's Wharf to the San Francisco Maritime National Historical Park and on to the Golden Gate National Recreation Area, ending at the Fort Mason Center. The intended effect of this action is to provide park visitors and transit-dependent residents with high-quality rail transit that improves transportation access and mobility between existing streetcar service at Fisherman's Wharf to San Francisco Maritime National Historical Park and Fort Mason Center. The Draft Environmental Impact Statement (EIS) presents and analyzes the potential consequences of implementing the alternatives.

Alternative 1, the No-Action Alternative, would provide no change from the existing historic streetcar line and would not provide transit connections to the Fort Mason Center.

Alternative 2, the Preferred Alternative, would extend the existing F-Line from Fisherman's Wharf to
ısion would include a street-running segment along Beach
eet-running segment and the Fort Mason Tunnel, a tunnel
ı two options for locations, Alternative 2A: North Loop (Fort
(Great Meadow). Project elements would include the
›ximately 0.85 miles, construction of 8-9 station platforms,
nnel, and installation of signals, crossings, wires and poles.

blic and agency scoping process, the impact analysis focuses
ıtion and circulation, air quality, noise and vibration, cultural
ual and aesthetic resources, night sky visibility and light
al resources, public health and safety, and public services and

›ervice will accept comments on the Draft EIS from the public
tion of the Environmental Agency's Notice of Availability in
nay check the park website at www.nps.gov/goga for date,
›e conducted by the National Park Service. For further
tact: Rick Foster at 415-561-2872 or Golden Gate NRA, Fort
›4123.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR EXTENSION OF F-LINE STREETCAR SERVICE TO FORT MASON CENTER

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ACRONYMS

ABAG – Association of Bay Area Governments

ABS – Automatic Block Signaling

AC Transit – Alameda-Contra Costa Transit District

ACHP – Advisory Council on Historic Preservation

ADA – Americans With Disabilities Act

AHPA – Archeological and Historic Preservation Act

APE – Area of Potential Effect

ARPA – Archeological Resources Protection Act

BAAQMD – Bay Area Air Quality Management District

BART – Bay Area Rapid Transit

BCDC – Bay Conservation and Development Commission

BMP – Best Management Practices

CARB – California Air Resources Board

CBC – California Building Code

CCR – California Code of Regulations

CDFG – California Department of Fish and Game

CDMG – California Division of Mines and Geology

CEQ – Council on Environmental Quality

CEQA – California Environmental Quality Act

CESA – California Endangered Species Act

CFR – Code of Federal Regulations

CGS – California Geologic Survey

CHP – California Highway Patrol

CLR – Cultural Landscape Report

CNDDB – California Natural Diversity Database

CNPS – California Native Plant Society

CO – Carbon Monoxide

CPUC – California Public Utility Commission

CZMA – Coastal Zone Management Act

dB – Decibels

DEIS – Draft Environmental Impact Statement

DOT – Department of Transportation

DPM – Diesel Particulate Matter

DTSC – Department of Toxic Substances Control

EDR – Environmental Data Resources

EIR – Environmental Impact Report

EIS – Environmental Impact Statement

EPA – Environmental Protection Agency

ESA – Environmental Science Associates

FESA – Federal Endangered Species Act

FHWA – Federal Highway Administration

FMC – Fort Mason Center

FTA – Federal Transit Administration

FY – Fiscal Year

GGNRA – Golden Gate National Recreation Area

GGT – Golden Gate Transit

GHG – Green House Gas

GMP – General Management Plan

HABS – Historic American Building Survey

HALS – Historic American Landscape Survey

LOS – Level of Service

MBTA – Migratory Bird Treaty Act

MCE – Maximum Credible Earthquake

MM – Modified Mercalli

MOA – Memorandum of Agreement

msl – mean sea level

MTA – Municipal Transportation Authority

MTC – Metropolitan Transportation Commission

Muni – San Francisco Municipal Railway

NAGPRA – Native American Graves Protection and Repatriation Act

NEPA – National Environmental Policy Act

NHLD – National Historic Landmark District

NHP – National Historical Park

NHPA – National Historic Preservation Act

NO2 – Nitrogen Dioxide

NOA – Notice of Availability

NOI – Notice of Intent

NPS – National Park Service

NPDES – National Pollutant Discharge Elimination System

NRCS – Natural Resources Conservation Service

NRHP – National Register of Historic Places

OCS – Overhead Contact System

OSHA – Occupational Safety and Health Administration

PCC – Presidential Committee Car

PCJPB – Peninsula Corridor Joint Powers Board

PGA – Peak Ground Acceleration

PM – Particulate Matter

PPV – Peak Particle Velocity

RCRA – Resource Conservation and Recovery Act

ROD – Record of Decision

ROW- Right of Way

SamTrans – San Mateo County Transit

SEL – Sound Exposure Level

SF Maritime NHP – San Francisco Maritime National Historical Park

SFFD – San Francisco Fire Department

SFMTA – San Francisco Municipal Transportation Agency

SFPD – San Francisco Police Department

SHPO – State Historic Preservation Office

SMARA – Surface Mining and Reclamation Act

SO2 – Sulfur Dioxide

SWPPP – Storm Water Pollution Prevention Plan

TAC – Technical Advisory Committee

TEP – Transit Effectiveness Program

USCG – United States Coast Guard

USDOT – United States Department of Transportation

USFWS – United State Fish and Wildlife Service

USGS – United States Geological Survey

VA – Value Analysis

VdB – Vibration velocity level

WHRS – Wildlife Habitat Relationship System

WPA – Works Progress Administration

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GLOSSARY OF TERMS

Automatic Block Signaling (ABS) - Under this system, signals indicate whether or not a train may enter a block (railway section) based on automatic train detection indicating whether a block is clear.

Action alternative – Project alternative that includes activities that would result in physical changes to the environment.

Active fault – An active fault is defined by the CGS as a fault that has had surface displacement within Holocene time (approximately the last 11,000 years).

Anthropogenic – Derived from human activities, as opposed to effects or processes that occur in the natural environment without human influences.

Alternatives – A reasonable range of options that can accomplish an agency's objectives.

Arterial Traffic – Traffic along an arterial road, which is a high-capacity road immediately beneath a highway level of service.

At-grade crossing – Areas where the road crosses the railway at the street level.

Best Management Practices - Effective, feasible (including technological, economic, and institutional considerations) conservation practices and land- and water management measures that avoid or minimize adverse impacts to natural and cultural resources. Best Management Practices may include schedules for activities, prohibitions, maintenance guidelines, and other management practices.

Corridor – Land between two termini within which traffic, transit, land use, topography, environment, and other characteristics are evaluated for transportation purposes.

Cultural resources – Aspects of a cultural system that are valued by or significantly representative of a culture or that contain significant information about a culture.

Cumulative actions – Actions that, when viewed with other actions in the past, the present, or the reasonably foreseeable future, regardless of who has undertaken or will undertake them, have an additive impact on the resource the proposal would affect.

Cumulative impact – Two or more environmental effects that, when considered together, are considerable or that compound or increase other environmental impacts.

Cut – Excavation into a slope. A road constructed on a hillside, for example, must be constructed partially in a cut area in order to provide a flat surface for the road.

Density – The number of individuals, usually by species, per unit area.

Direct effect – An impact that occurs as a result of the proposal or alternative in the same place and at the same time as the action.

Environmental cases – Environmental cases are sites suspected of releasing hazardous substances or that have had cause for hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

Environmental impact statement (EIS) – A detailed NEPA document that is prepared when a proposal or alternatives have the potential for significant impact on the human environment.

Environmentally preferred alternative – Of the alternatives analyzed, the one that would best promote the policies in NEPA Section 101. This is usually selected by the project team members. It is presented in the NPS NEPA document (draft and final EIS or EA) for public review and comment.

Facultative species – Species that can occur both in wetland and upland habitat.

Fill – Material used to raise the level of the land. A road constructed on a hillside, for example, must be constructed partially on fill (and partially within an excavated area, known as "cut") in order to provide a flat surface for the road.

Floodplain – Land on either side of a stream or river that is submerged during floods.

Fugitive dust – The dust released from activities associated with construction, manufacturing, or transportation.

Hazardous waste – Hazardous materials that no longer have practical use, such as substances that have been discarded, spilled, or contaminated, or that are being stored temporarily prior to disposal.

Headway – The time interval or distance between two vehicles, as railroad or subway cars, traveling in the same direction over the same route.

Hydrology – The science dealing with the properties, distribution, and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

Impact topics – Specific natural, cultural, or socioeconomic resources that would be affected by the proposed action or alternatives (including no action). The magnitude, duration, and timing of the effect to each of these resources are evaluated in the impact section of an EA or an EIS.

Human environment – Defined by CEQ as the natural and physical environment, and the relationship of people with that environment (1508.14). Although the socioeconomic environment receives less emphasis than the physical or natural environment in the CEQ regulations, the NPS considers it to be an integral part of the human environment.

Impact topics – Specific natural, cultural, or socioeconomic resources that would be affected by the proposed action or alternatives (including no action). The magnitude, duration, and timing of the effect on each of these resources is evaluated in the impact section of an EA or an EIS.

Impervious Surface – A hard surface that either prevents or retards the entry of water into the soil.

Indirect impact – Reasonably foreseeable impacts that occur removed in time or space from the proposed action. These are "downstream" impacts, future impacts, or the impacts of reasonably expected connected actions (e.g., growth of an area after a highway to it is complete).

Invasive Species – Species that reproduce aggressively, that are typically nonnative (i.e., do not naturally occur) to an ecosystem under consideration, and that cause or are likely to cause economic or environmental harm or harm to human health.

Lead agency – The agency either preparing or taking primary responsibility for preparing the NEPA document.

Level of Service (LOS) – A metric which qualitatively characterizes traffic conditions associated with varying levels of vehicle traffic, based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined, ranging from LOS A (indicating free-flow traffic conditions with little or no delay experienced by motorists) to LOS F (indicating congested conditions where traffic flows exceed design capacity and result in long delays). This LOS grading system applies to both signalized and unsignalized intersections.

Major federal action – Actions that have a large federal presence and that have the potential for significant impacts on the human environment. They include adopting policy; implementing ru1es or regulations; adopting plans, programs, or projects; ongoing activities; issuing permits; or financing projects completed by another entity.

Mitigation – A modification of the proposal or alternative that lessens the intensity of its impact on a particular resource.

National Geodetic Vertical Datum (NGVD) – A fixed surface reference established by the U.S. Coast and Geodetic Survey to which relief features and elevation data are referenced.

National Register of Historic Places – The comprehensive list of districts, sites, buildings, structures, and objects of national, regional, state, and local significance in American history, architecture, archeology, engineering, and culture. This list is maintained by the National Park Service under authority of the National Historic Preservation Act of 1966.

NEPA process – The objective analysis of a proposal to determine the degree of its environmental and interrelated social and economic impacts on the human environment, alternatives and mitigation that reduce those impacts, and the full and candid presentation of the analysis to, and involvement of, the interested and affected public.

No-Action Alternative – Project alternative that would result in no project being implemented.

Notices of Availability – Separate notices submitted to the Federal Register that the draft EIS and the final EIS are ready for distribution.

Notice of Intent (NOI) – The notice submitted to the Federal Register indicating that an EIS will be prepared. It describes the proposed action and alternatives, identifies a contact person at the NPS, and gives time, place, and descriptive details of the agency's scoping process.

Off-Peak Season – Time period during which a recreational or tourist area received the least number of visitors.

Overhead Contact System (OCS) – A single-wire connection system that provides power to the street cars using overhead poles.

Pantograph – A device usually consisting of two parallel, hinged, double-diamond frames, for transferring current from an overhead wire to a vehicle, such as a trolley car or electric locomotive.

Peak Season – Time period during which a recreational or tourist area received the greatest number of visitors.

Particulate Matter (PM10) – Any material that exists as solid or liquid in the atmosphere that is less than 10 microns. Particulate matter may be in the form of ash, soot, dust, fog, fumes etc.

Permitted hazardous materials uses – Permitted hazardous materials uses are facilities that use hazardous materials or handle hazardous wastes but that comply with current hazardous materials and hazardous waste regulations.

Preferred alternative – The alternative an NPS decision maker has identified as preferred at the draft EIS or EA stage. Identification of the preferred alternative helps the public focus its comments during review of the NEPA document.

Record of Decision (ROD) – The document that is prepared to substantiate a decision based on an EIS. It includes a statement of the decision made, a detailed discussion of decision rationale, and the reasons for not adopting all mitigation measures analyzed, if applicable.

Retaining wall – A wall constructed to hold earth secure. Retaining walls are typically constructed on sloping grades in order to provide a flat area for a building, road, or trail. A retaining wall can be constructed below the flat area in order to hold earth in place and keep the flat area intact. A retaining wall can also be constructed above the flat area in order to keep earth from sliding into the flat area.

Revegetation – Plant stock that is germinated and grown in one location, and then planted at another site.

Right-of-way – A strip of land that is granted, through an easement or other mechanism, for transportation or utility purposes.

Riparian – Relating to, or living or located on the banks of a river or stream.

Scoping – Internal NPS decision making on issues, alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, lead and cooperating agency roles, available references

and guidance, defining purpose and need, and so forth. External scoping is the early involvement of the interested and affected public.

Soundscape – The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive, and can be transmitted through air, water, or solid materials.

Special-status species – For purposes of this EIS/EIR, any species listed or proposed for listing under the state or federal endangered species acts, or recognized as locally rare by recognized authorities.

Spill sites – Spill sites are locations where a spill has been reported to the state or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

Traction Power System – The system that provides power to the overhead contact system by connecting it to an existing substation.

Trip Generators – Trip generators are activity centers, sites, or amenities that attract people, whether they are local residents or out-of-town visitors.

Watershed – The area from which water drains to a single point or body of water; also called drainage basin.

Wetland – An area that floods periodically, has waterlogged soils, or is covered with a relatively shallow later of fresh or saltwater.

Executive Summary

EXECUTIVE SUMMARY

INTRODUCTION

The National Park Service (NPS) is preparing an environmental impact statement (EIS) for an extension of the historic streetcar F-line from Fisherman's Wharf to the Fort Mason Center. The National Park Service is the lead agency and the San Francisco Municipal Transportation Agency (SFMTA) and the Federal Transit Administration are the cooperating agencies under the National Environmental Policy Act (NEPA). The proposed Project is the culmination of a cooperative effort by the National Park Service with the Golden Gate National Recreation Area and the San Francisco Maritime National Historical Park, the City and County of San Francisco, the SFMTA, and the Presidio Trust. Studies from these agencies showed that these urban national park destinations could benefit from improved regional and local transit connectivity. This improved service connectivity would help accommodate existing and future visitor demand. Based on those studies, conceptual approaches to address alternative transportation needs were identified and evaluated against the purpose and need of the Project, park management objectives, and operability constraints. One Action alternative (the Proposed Action) and the No Action alternative were identified to be carried forward for detailed evaluation in this Draft EIS (DEIS). This document has been prepared in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 United States Code 4321 et seq.), and *Director's Order No. 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001).

The Project proposes to extend the F-Market & Wharves Line (F-line) from Fisherman's Wharf through the San Francisco Maritime National Historical Park (SF Maritime NHP) and the Golden Gate National Recreation Area (GGNRA), in San Francisco, California. The GGNRA and the SF Maritime NHP are two separate National Park Service units in San Francisco's northeastern waterfront; SF Maritime NHP is adjacent to the GGNRA, which includes Fort Mason. The GGNRA was established in 1972, and encompasses over 75,000 acres of land in San Francisco, Marin, and San Mateo Counties. The 50-acre SF Maritime NHP, established in 1988, includes the Maritime Museum and a Senior Center (both housed in the original Aquatic Park Bathhouse), Aquatic Park, Municipal Pier, Hyde Street Pier, and a collection of National Historic Landmark vessels.

Project Study Area

The study area for the Project in San Francisco's northeastern waterfront is bounded by Mason Street on the east, Bay Street on the south, Fillmore Street on the west and the bayfront, including the piers and parklands within the east-west boundary, on the north.

Part of the SF Maritime NHP has been designated as the Aquatic Park National Historic Landmark District (NHLD). Fort Mason—which includes the San Francisco Port of Embarkation NHLD[1]—consists of Upper Fort Mason and Lower Fort Mason. Lower Fort Mason encompasses the historic

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[1] The San Francisco Port of Embarkation NHLD includes all of Lower Fort Mason and only Building 201 in Upper Fort Mason.

piers and buildings in which Fort Mason Center (the Center) is located. Fort Mason Center is a non-profit entity that is a destination for programs, events and organizations. Both the NHLDs mentioned above are in dense, urban locations, directly adjacent to high-density residential and commercial districts. These districts are characterized by high visitation rates, high pedestrian and automobile traffic volumes, and intense recreational and commercial use.

PROJECT PURPOSE AND NEED

Purpose of Project

The purpose of this project is to provide park visitors and transit-dependent residents with high-quality rail transit that improves transportation access and mobility between existing streetcar service at Fisherman's Wharf and Fort Mason Center in GGNRA. The streetcar service would have connection to the regional transit rail services, while respecting the settings, context, and resources of these two national park destinations and avoiding or minimizing adverse effects to National Historic Landmarks and National Register of Historic Places (NRHP) listed or eligible properties.

Need for Project

The need for this project resulted from the following issues:

- **Inadequate Regional Transit Access to Fort Mason Center**

  Visitors traveling to Fort Mason on regional transit are required to make multiple transfers to reach their destination. For regional riders using the Bay Area Rapid Transit (BART), or regional services offered by Caltrain, access to Fort Mason frequently requires at least two transfers. Alameda-Contra Costa Transit District (AC Transit) and ferry riders must transfer at least two, and often three, times to reach Fort Mason. Multiple transfers are a deterrent to the use of regional transit to reach Fort Mason.

  Nearby transit service does not directly link the Fort Mason Center with transit lines. The 28 bus line provides the closest connection to Fort Mason Center with a station at Marina Boulevard and Laguna Street; however this bus line originates in Daly City and only services the western and northern parts of San Francisco.[2] Passengers arriving near Upper Fort Mason via the 47 or 49 bus lines disembark at Van Ness Avenue and North Point Street and then walk approximately 0.6 miles along streets or a path through the Great Meadow to reach Fort Mason Center. Passengers arriving via the 30 bus line would disembark at Chestnut Street and Laguna Street and then walk approximately 0.3 miles along Laguna Street to the Fort Mason Center entrance. Visitors coming from Fisherman's Wharf take the existing F-line to Jones Street and then walk approximately 1 mile to reach the Fort Mason Center.

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[2] SFMTA's *Transit Effectiveness Project* recommends changes to the 28 and 28L bus line that would eliminate the bus stop closest to Fort Mason Center at Marina Boulevard. The new route would run along Lombard Street and terminate at Van Ness Avenue and North Point Street (SFMTA 2008b).

- **Limited Transportation Options for Transit-Dependent Residents**

  In the spirit of bringing national parks to the people, GGNRA and SF Maritime NHP reach out to, and promote the richness and breadth of the national park system to a diverse urban community, including city residents who may be experiencing a national park for the first time and who may not have access to private vehicles. One of the goals of NPS is to provide recreational and cultural facilities and destinations to transit-dependent residents. Although the GGNRA and SF Maritime NHP are in the City of San Francisco (the City) and therefore closer to these residents than many other national parks, the public transportation access required by most potential park patrons continues to be insufficient, often requiring multiple transfers to reach the NPS sites along the waterfront. As noted above, multiple transfers can be a deterrent to transit use.

  Underserved populations living outside San Francisco may require transfers within their communities to reach the regional transportation network, as described above. Underserved residents living inside San Francisco are interspersed throughout most of the City. However, according to the 2006 San Francisco Mayor's Office of Community Investment *2005-2010 Consolidated Plan*, underserved areas are in the eastern and southeastern portions of the City. While most San Francisco residents generally require at least one transfer to access the parks, those living in the eastern/southeastern portion of the City may require additional transfers. For example, portions of the Bayview Hunters Point neighborhood require a minimum of two transfers to access the parks. The 1980 GGNRA General Management Plan identified the need for an extension of transit service between the park and transit dependent neighborhoods (1980).

- **Limited Connectivity to Northeastern Waterfront Cultural and Recreational Corridor**

  Over the past 20 years, San Francisco's northeastern waterfront has been transformed from an underused industrial area to a vibrant waterfront cultural corridor stretching from AT&T Park to the Presidio. This corridor includes South Beach Marina, the Ferry Building, Pier 7, Pier 39, the Aquarium of the Bay, Fisherman's Wharf, SF Maritime NHP and Fort Mason Center. Throughout the northeastern waterfront corridor there is a high level of pedestrian activity, with visitors seamlessly moving between the commercial establishments and the NPS facilities. Many of these attractions are linked by SFMTA's historic streetcar service (the F Line), which has proven to be popular with visitors and residents alike. However, this service does not currently reach the National Park Service's recreational and historic attractions including the Hyde Street Pier, Aquatic Park, the Maritime Museum, the Municipal Pier, nor Upper and Lower Fort Mason including the Fort Mason Center.

  The facilities within Fort Mason and SF Maritime NHP are integrated into the fabric of the City, serving as an arts and cultural activity center. Many of the 14 million annual visitors to Fisherman's Wharf, a major tourist destination immediately adjacent to SF Maritime NHP, are also drawn to the neighboring national park destinations. The necessity of multiple transfers slows trips and increases the difficulty for visitors or residents unfamiliar with the local transit network.

- **Insufficient Transportation Infrastructure to Accommodate Existing and Projected Visitor Demand**

  Fort Mason Center hosted more than 11,400[3] events in fiscal year 2009 (October 2008-September 2009), bringing approximately 1.7 million visitors to the site (FMC 2009a). **Table ES-1** shows a breakdown of projected attendance at major events hosted by the Fort Mason Center in 2010. These figures do not include regularly scheduled meetings, classes, and smaller events. Many events at Fort Mason Center are attended by thousands of visitors, with the largest events attended by 8,000 visitors. Other events in the area that impact the Fort Mason Center such as the Bridge to Bridge Run bring over 10,000 visitors to the area.

TABLE ES-1: FORT MASON CENTER PROJECTED ATTENDANCE FOR MAJOR EVENTS[a] IN 2010

Visitor Attendance[b]	Number of Events
0-100	88
101-500	349
501-1000	83
1001-5000	66
Over 5000	2

[a] Major events do not include the daily regularly scheduled meetings, classes and smaller events at the FMC

[b] Crowd numbers for events are estimates

Source: Fort Mason Center Parking Impact Notice, 2010.

Transportation access to Fort Mason Center is primarily by automobile, in part due to the inadequate regional and local transit access described above. The Fort Mason Center is served directly by only one bus line (the 28-19th Avenue); this line does not originate from downtown or other parts of the City frequented by visitors, and it has poor connections to regional transit lines and to local transit lines serving the rest of San Francisco. Additionally, it will have limited service to the Van Ness Avenue corridor in the future due to a bus rapid transit project on Van Ness Avenue.[4] At the Fort Mason Center, there are 446 parking spaces available. While parking volumes for this lot are highly cyclical and depend on the events occurring at the Center, the annual volume of cars for 2009 was 236,271 (FMC 2009b). This results in substantial parking problems, especially on weekends, when parking spills over into the adjacent Marina neighborhood and adjacent parking areas (Gashouse Cove and Marina Green) that are not under NPS jurisdiction. Some event organizers hire valet services or use Marina Middle School for overflow parking.

SF Maritime NHP has 4 million visitors each year. The SF Maritime NHP relies on the availability of on-street or commercial parking lots available for the Fisherman's Wharf area. The number of visitors coming to the Fort Mason Center and SF Maritime NHP is expected to increase in the future. With the San Francisco Bay Area[5] population projected to grow 18.8 percent by 2030 (presently 7.3 million) (ABAG 2009), transit links will be critical to

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[3] Events include classes, meetings, conferences, exhibitions and performances; many occur simultaneously each day.

[4] The Van Ness Avenue Bus Rapid Transit (BRT) Project would implement transit improvements along the Van Ness Corridor from Mission Street to Lombard Street.

[5] Bay Area region includes the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma (ABAG 2009).

maintaining access to the Parks. The Bay Area region recognized the importance of the expansion of historic streetcar service by including it as one of the "Strategic Expansion" projects in San Francisco in the *Transportation 2030 Plan* for the San Francisco Bay Area (MTC 2005.) The planned restoration of a historic pier at the Fort Mason Center will provide additional exhibition space, as will the renovated Maritime Museum recently re-opened to the public. These improvements are anticipated to draw a greater number of visitors to the national park destinations, which would in turn exacerbate existing parking and traffic capacity demands.

The *Fort Mason Center Long-Term Lease Environmental Assessment* projects an increase in visitor levels to the Fort Mason Center by 14.5 percent contingent upon the renovations of Pier One, which is currently not used as an event space. If Pier One was restored, the 2003 Environmental Assessment (EA) projected that the 1.6 million annual visitors would be increased to 1.9 million for the entire Fort Mason Center. The EA also predicts that the increase in visitors from the development of Pier One could increase transit demand.

The 2007 *Fort Mason Center Employee Survey* (URS 2009f) concluded that approximately 17 percent of Fort Mason Center employees currently arrive at work by transit and that 48 percent of employees noted they would have taken the F-line if it already served Fort Mason directly. Similarly, the 2007 *Fort Mason Intercept Survey* (URS 2009f), which surveyed 729 visitors to Fort Mason Center found that approximately 11-14 percent of current visitors reported that they took transit to Fort Mason and 45 percent of visitors said that they would have taken the F-line if it already served Fort Mason Center.

NPS goals for transportation in the GGNRA include the reduction of automobile-based trips for recreational travel, and inter- and intra-park transportation networks coordinated with existing transportation systems (NPS 1980). The *San Francisco Maritime National Historical Park Climate Change Action Plan* (NPS 2010a) and the *Golden Gate National Recreation Area Climate Change Action Plan* (NPS 2008b) both seek to reduce fuel consumed by visitors by maximizing transportation options in the parks and providing linkages to public transportation systems. This is particularly desirable, appropriate, and feasible at dense, urban national parks such as SF Maritime NHP and GGNRA, where existing public transit infrastructure can be extended at a reasonable cost.

- **Infrastructure Constraints Impacting Effectiveness and Operations of Fort Mason Center**

  Fort Mason Center is an international model for an urban park setting which preserves historic buildings for uses consistent with and related to the mission of the National Park Service and GGNRA.

  Fort Mason Center hosts numerous expositions, conferences, and events throughout the year however, the closest hotels are in the Fisherman's Wharf area and along Lombard Street and Van Ness Avenue. The lack of a direct transit connection between the hotels in the Fisherman's Wharf area and Fort Mason Center limits the potential of the center as an event destination. With better transit, Fort Mason Center would also function better as a conference/meeting location. The lack of direct transit limits the number of transit-dependent visitors who participate in activities at the center, and may be a deterrent to others who avoid the area due to roadway congestion and difficulty of parking. Furthermore, the lack of transit to the Center directly contributes to roadway congestion along Marina Boulevard which is a direct link to the Golden Gate Bridge. Its unique position as a large multi-use venue offers a tremendous opportunity to benefit businesses and nonprofit organizations as well as 1.7 million visitors per year.

Under the lease terms with the National Park Service, Fort Mason Center has a financial obligation to assist with funding historic preservation and rehabilitation of all of the buildings and amenities on the campus. Funds to support operations are generated by tenant rentals at the Center, including a restaurant, a café, art galleries, non-profit organizations, and museums. Additional revenues are generated by visual, performing and literary arts events, large and small expositions, conferences and meetings. Funds for rehabilitation and restoration of the Center will be derived from financing supported by these revenues. Major funding is also derived from the philanthropic community which supports the Center's programs.

PUBLIC REVIEW PROCESS

The Notice of Intent (NOI) for the Project was published in the Federal Register on March 29, 2006. The NOI announced the preparation of an EIS by the National Park Service, as the federal lead agency. The NOI also provided information on Project issues and potential impacts and invited comments, questions, and suggestions on the scope of the EIS during the 60-day public scoping period, which ended on May 29, 2006. Postcards notifying the public of the commencement of the planning process were sent to approximately 4,000 individuals; the mailing list was developed from GGNRA, SF Maritime NHP, and SFMTA databases. A half-page ad announcing the public scoping meeting and requesting input was placed in the *San Francisco Examiner* on May 3, 2006, and a legal notice was posted in the *San Francisco Chronicle* on May 6, 2006. Public and agency scoping meetings were held on May 9, 2006 at the Fort Mason Officer's Club in San Francisco. A meeting with the NPS and the cooperating agencies was held from 2:00 p.m. to 4:00 p.m. and the public meeting was held from 6:00 p.m. to 9:00 p.m.

During the scoping period, the National Park Service received 101 comments from individuals, organizations representing environmental, conservation and recreational interests, and governmental agencies. The primary environmental concerns focused on changes in traffic and parking, impacts on parklands and recreational facilities, noise and vibration, visual impacts, and cultural resources.

Input was also solicited from the National Park Service Historic Streetcar Extension Technical Advisory Committee (TAC), which consists of members of GGNRA, SF Maritime NHP, SFMTA, Fort Mason Center, Market Street Railway, San Francisco County Transportation Authority, Golden Gate National Parks Conservancy, San Francisco Recreation and Park Department, and the Federal Transit Administration (FTA). NPS staff with expertise on park resources were also consulted. After the initial scoping period, the National Park Service continued to update the public about the Project during the park's quarterly open houses.

THE ALTERNATIVES

The study area is divided into the following four segments analyzed separately in the alternatives: In-Street; Transition; Fort Mason Tunnel; and Turnaround. During the alternatives development process alternatives were examined for each of these segments.

In-Street Segment. This approximately 2,500 foot street running segment runs along Beach Street between Jones Street and the base of Polk Street (approximately adjacent to the Maritime Museum).

This segment would connect the terminus of the existing F-line at Jones Street with the proposed F-line extension.

Transition Segment. This approximately 750 foot segment connects the In-Street Segment from Beach Street, through San Francisco Maritime NHP, and up to the Fort Mason Tunnel Segment. This segment crosses Van Ness Avenue before entering the tunnel.

Fort Mason Tunnel Segment. The existing 1,500 foot tunnel segment runs underneath Fort Mason and the Great Meadow from the east tunnel portal at Van Ness Avenue to the west tunnel portal at Marina Boulevard and Laguna Street. It is a single-track tunnel, used for freight train movements until the late 1970s. This tunnel segment would need to accommodate the bi-directional movement of streetcars on a single track. Structural rehabilitation of the tunnel would be required for its use.

Turnaround Segment. The turnaround segment occurs between the west tunnel portal at Marina Boulevard and Laguna Street. The areas considered in the alternatives include the lower Fort Mason (Fort Mason Center) parking lot and the Great Meadow. The turnaround segment would be the terminus of the proposed F-line extension and would allow for westbound streetcars to turnaround in a loop of track before returning eastbound back through the Fort Mason Tunnel.

Alternative 1 – No Action

Alternative 1 provides a baseline for comparing the other alternative, evaluating the magnitude of proposed changes, and measuring the effects of those changes. The No Action alternative follows the guidance of the Council on Environmental Quality, which describes the No Action alternative as representing no change from the current management direction. Under the No Action Alternative, the F-line would not be extended beyond Fisherman's Wharf; the Transition Segment within the Aquatic Park NHLD would remain undisturbed; the Fort Mason Tunnel would remain closed and would not be renovated or made seismically sound; and the Turnaround Areas (Great Meadow or lower Fort Mason) within the Fort Mason National Register Historic District and the San Francisco Port of Embarkation NHLD would remain undisturbed.

The 2007 *Fort Mason Center Employee Survey* (URS 2009f) concluded that approximately 17 percent of Fort Mason Center employees currently arrive at work by transit. The 2007 *Fort Mason Intercept Survey* (URS 2009f), which surveyed 729 visitors to Fort Mason Center found that approximately 11-14 percent of current visitors reported that they took transit to Fort Mason

The lack of connectivity between the Fort Mason Center and nearby transit lines would continue. The 28 bus line provides the closest connection to Fort Mason Center with a station at Marina Boulevard and Laguna Street; however this bus line originates in Daly City and only services the western and northern parts of San Francisco.[6] Passengers arriving near Upper Fort Mason via the 47 or 49 bus lines, disembark at Van Ness Avenue and North Point Street and then walk approximately 0.6 miles along streets or a path through the Great Meadow to reach Fort Mason Center. Passengers arriving via the

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6 SFMTA's *Transit Effectiveness Project* recommends changes to the 28 and 28L bus line that would eliminate the bus stop closest to Fort Mason Center at Marina Boulevard. The new route would run along Lombard Street and terminate at Van Ness Avenue and North Point Street (SFMTA 2008b).

30 would disembark at Chestnut Street and Laguna Street and then walk approximately 0.3 miles along Laguna Street to the Fort Mason Center entrance. Visitors coming from Fisherman's Wharf take the existing F-line to Jones Street and then walk approximately 1 mile to reach the Fort Mason Center.

Alternative 2 – Proposed Action Alternative (with Turnaround Options)

The Proposed Action would extend the existing F-line streetcar service from Jones Street to Fort Mason Center. This section describes the Proposed Action components, as well as anticipated construction requirements and operation. Alterative 2 includes a preferred In-Street alignment, Transition, Fort Mason Tunnel, and Turnaround Segments. The Turnaround Segment presents two options, Alternative 2A: North Loop (located in the Fort Mason Center parking lot) and Alternative 2B: South Loop (located in Great Meadow), which are analyzed separately. The In-Street Segment presents both mixed traffic and semi-exclusive options (autos do or do not share track right-of-way); however these would be determined during the final design phase. They have been analyzed separately as appropriate in the resource sections.

Project Components. If implemented, the extension would include approximately 0.85 mile of new rail track; associated features such as signals, crossings, wires and poles; approximately 8-9 new platforms; new designated stops; retrofitting of the historic State Belt Railroad tunnel (Fort Mason Tunnel); and construction of a track turnaround in the Fort Mason Center parking lot or Great Meadow (see **Table ES-2** for details).

TABLE ES-2: ALTERNATIVE 2 PROJECT SEGMENT DETAILS

	In-Street Segment	Transition Segment	Fort Mason Tunnel Segment	Turnaround Segment
Alternative 2 Options	Operates in both directions on Beach Street between Leavenworth Street and the transition at Van Ness Avenue. Four platforms would be added to this segment. Options to be determined during design phase: 1) shared auto/streetcar operation 2) semi-exclusive for the eastbound alignment and shared operation for the westbound alignment 3) hybrid of the two options	The transition segment takes the alignment from the double-track, street-running segment to the east, shifting the alignment to NPS property to the west of Polk Street. The line would move from double track to single track between two new platforms and the tunnel portal.	The streetcar extension would run on a single track through the tunnel. Tunnel improvements would include installation of new track and overhead lines and reconstruction of the tunnel interior	**Alternative 2A: North Loop (Preferred).** In the North Loop turnaround tracks would loop north out of the Fort Mason Tunnel and enter the Lower Fort Mason parking lot. Two platforms would be constructed within the loop. **Alternative 2B: South Loop.** In the South Loop turnaround tracks would loop south out of the Fort Mason Tunnel and enter the Great Meadow. One platform would be constructed in this loop.

PREFERRED ALTERNATIVE

The Preferred Alternative is Alternative 2 – Action Alternative. This alternative was determined after a multi-year alternative development and screening process during which time alternatives for the project's street-running alignment, transition segment, and turnaround segment were analyzed. These alternatives were evaluated based on a standard set of criteria. Alternatives that were unreasonable were eliminated from further analysis. Following this process a preferred street-running alignment and transition segment were selected. However, two options remained for the turnaround segment.

The North Loop (Alternative 2A) and South Loop (Alternative 2B) Turnaround Alternatives were analyzed during a 1.5-day Value Analysis (VA) workshop held in August of 2010. In the Value Analysis Workshop, the North Loop and South Loop turnaround alternatives were evaluated using a process called Choosing by Advantages (CBA), where decisions are based on the weighted importance of the advantages between alternatives with capital and life cycle costs factored in last, to illustrate benefits to cost. In using CBA to determine a preferred alternative, the VA team identified the alternative that offers the highest total importance of advantages at the lowest cost (in both initial and life cycle).

In this workshop, the North Loop was identified as best value due to the following advantages:

- Significantly Better at Limiting Disruption to Natural Resources;
  - No impervious surface is added (can increase pervious surface between rail);
  - Does not remove vegetation;
  - Emits the least amount of emissions during construction (less earth moved).
- Somewhat Better at Improving Visitor Experience;
  - Limited view shed impacts by adding streetcars and infrastructure in the Fort Mason Center (FMC) parking lot;
  - Provides direct interior connection between SF Maritime NHP and Fort Mason Center.
- Slightly Better at Protecting Public Health, Safety and Welfare;
  - All the alternatives create potential conflicts between pedestrians, auto and transit. This alternative limits those conflicts particularly with bicycles. It may include conflict with bicycles in the future;
  - Allows for redesign of the Bay Trail with less change required (this is an independent project).
- Slightly Better at Supporting Criteria for Large Events;
  - It is best able to manage headway (frequency and storage of streetcars);
  - Creates more room to queue visitors away from Laguna Street.
- Somewhat Better at Accessing Disabled Streetcar;
  - Creates better access to disabled streetcar in the storage area for repair via service truck in this location.
- Slightly Better at Minimizing Noise & Sound Impacts;

- Minimizes noise impacts on residential neighborhoods since it is the farthest from the residential areas;
- Minimizes vibration impacts. All the options create vibration but this option is 10 feet farther away from the historic structures than the other alternatives.

- Somewhat Better at Attracting New Tenants:
  - This alternative gives Fort Mason Center the ability to attract new tenants (via *Fort Mason Center Long-Term Lease Environmental Assessment*).

ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative 1 (the No-Action Alternative) does not meet project goals, purpose, or need and does nothing to reduce the number of automobiles used to access the park and/or the Fort Mason Center. Changes to the mix of transportation modes [autos and transit] serving the project area resulting from the Preferred Alternative identified a 14.4 percent increase in transit use for daily person trips to Fort Mason Center between the No Project and implementation of the Project with the F-line extension. The result would be a long-term, moderate, beneficial impact which leads to the conclusion that the Preferred Alternative is the environmentally preferred alternative.

This conclusion is reached looking at current conditions. The environmental preference for an alternative that provides increased transit is further supported by future conditions. The Fort Mason Center Long-Term Lease Environmental Assessment projects an increase in visitor levels by 14.5 percent contingent upon the renovations of Pier One, which is currently not used as an event space. If Pier One was restored, the 2003 EA projected that the 1.6 million annual visitors would be increased to 1.9 million for the entire Fort Mason Center. Increased transit would support these visitors and be in compliance with renewable goals set out in Director's Order #12.

ENVIRONMENTAL CONSEQUENCES

The following topics were raised during the scoping process and selected for detailed analysis: Land Use; Socioeconomics; Transportation and Circulation; Air Quality; Noise and Vibration; Cultural Resources; Recreation and Visitor Use; Visual and Aesthetic Resources; Night Sky Visibility and Light Pollution; Geology, Soils and Seismicity; Biological Resources; Public Health and Safety; Public Services and Utilities. Rational for selection of each impact topic was based on potential for substantive impact; environmental statues, regulations, and executive orders; and/or NPS management policies and guidance. **Table ES-3** summarizes the potential impacts of the Project and proposes mitigation measures.

Table ES-3: Summary of Impacts and Mitigation

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Land Use				
Alternative 1 would result in no direct, indirect impacts to land use	The implementation of Alternative 2 would result in a minor long-term adverse impact to land use practices due to change in land use of the existing site, however the Project would remain consistent with applicable land use plans and policies	The North Loop Turnaround Option would result in a negligible impact to land use	The South Loop Turnaround Option would result in a long-term moderate adverse impact	N/A
Socioeconomics				
Alternative 1 would have no economic impacts to the San Francisco economy	Alternative 2 would have short-term negligible beneficial construction related economic impacts and long-term negligible beneficial operations related economic impacts on the San Francisco economy	The North Loop Turnaround Option would result in negligible positive short-term economic impacts to the City and County of San Francisco economy	The South Loop Turnaround Option would result in negligible positive long-term economic impacts to the City and County of San Francisco economy.	N/A
Transportation and Circulation				
Transit Operations				
Alternative 1 would result in no impacts to transit operations	Alternative 2 would result in a long-term, moderate, beneficial impact	The North Loop Turnaround Option would result in a long-term, moderate, beneficial impact	The South Loop Turnaround Option would result in a long-term, moderate, beneficial impact	N/A
Traffic Safety				
Alternative 1 would result in long-term, minor, adverse impacts to traffic safety conditions	<u>In-Street Segment</u>: long-term, negligible, adverse impact <u>Transition Segment</u>: long-term, minor, adverse impact	The North Loop Turnaround Option would result in a long-term, minor, adverse impact	The South Loop Turnaround Option would result in a long-term, minor, beneficial impact	TRANS-2: Install Wayfinding Devices

TABLE ES-3: SUMMARY OF IMPACTS AND MITIGATION (CONTINUED)

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 ACTION ALTERNATIVE	ALTERNATIVE 2A PROPOSED ACTION WITH NORTH LOOP OPTION	ALTERNATIVE 2B PROPOSED ACTION WITH SOUTH LOOP OPTION	MITIGATION MEASURES
Transportation and Circulation (cont.)				
Parking				
Alternative 1 would result in no impacts to parking conditions	The overall impact would be long-term, minor and adverse	The North Loop Turnaround Option would result in a long-term, minor, adverse impact	The South Loop Turnaround Option would not affect parking conditions at Fort Mason Center, and would not displace any parking spaces resulting in no impact	TRANS-3: Reconfigure On-Street Parking Spaces TRANS-4: Implement Parking Time Restrictions
Traffic Flow				
Alternative 1 would result in long-term, minor, adverse impacts to traffic flow	The result with implementation of the Public Realm Plan would be a long-term, minor, adverse impact, and without implementation of the Public Realm Plan would be a long-term, major, adverse impact	N/A	N/A	TRANS-1: Optimize Traffic Signal Timing
Air Quality				
Alternative 1 would result in no short- or long-term air quality or greenhouse gas emission impacts, either beneficial or adverse	Short-term adverse air quality impacts would result from daily maximum construction activities. With implementation of mitigation measures, short-term air quality impacts would be minor to moderate and adverse Alternative 2 would result in negligible to minor beneficial operational impacts to both regional and local air quality as well as greenhouse gas emissions	The North Loop Turnaround Option would result in a net negligible to minor beneficial operational air quality impact. Construction-related GHG emissions are considered a minor adverse impact with respect to global climate change. The North Loop Turnaround Option would result in a minor net beneficial impact to GHG emissions.	The South Loop Turnaround Option would result in a net minor beneficial operational air quality impact. The South Loop option would have the same net minor adverse construction-related GHG emission impact with as would occur with the North Loop Option The South Loop option would have the same net minor beneficial impact with regard to GHG emissions as would occur with the North Loop Option.	AIR-1: Implement BAAQMD Basic Construction Mitigation Measures

TABLE ES-3: SUMMARY OF IMPACTS AND MITIGATION (CONTINUED)

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 ACTION ALTERNATIVE	ALTERNATIVE 2A PROPOSED ACTION WITH NORTH LOOP OPTION	ALTERNATIVE 2B PROPOSED ACTION WITH SOUTH LOOP OPTION	MITIGATION MEASURES
Noise and Vibration				
Alternative 1 would result in no new short- or long-term noise or vibration impacts, either beneficial or adverse	Alternative 2 would result in major adverse impacts to the residential units on the corner of Hyde and Beach Streets and at Ghirardelli Square as well as hotels along Beach Street and the Maritime Museum. Impacts would result from construction noise, construction-related vibration, operational noise and operational vibrations. Identified mitigation would reduce these major adverse impacts to the moderate level	The North Loop Turnaround Option would result in the following: Construction Noise: minor adverse impact Construction Vibration: minor adverse impact. Operational Noise: moderate adverse impact Operational Vibration: minor adverse impact similar to existing vibration levels monitored in the area	The South Loop Turnaround Option would result in the following: Construction Noise: minor adverse impact Construction Vibration: minor adverse annoyance impact at the residences on Laguna Street. Operational Noise: moderate adverse impact Operational Vibration: minor adverse impact	NOISE-1: Implement Construction Noise Mitigation NOISE-2: Implement Operational Noise Mitigation VIBR-1: Implement Construction Vibration Mitigation VIBR-2: Implement Operational Vibration Mitigation
Cultural Resources				
Alternative 1 would not result in any new short- or long-term impacts, either beneficial or adverse	Impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features in the In-Street and Transition segments range from negligible to moderate adverse impact, see Table 4.7-1 and Table 4.7-2 for details	The North Loop Turnaround Option would result in impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features range from negligible to moderate adverse impact, see Table 4.7-1 for details	The South Loop Turnaround Option would result in impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features range from negligible to moderate adverse impact, see Table 4.7-2 for details	CUL-1: Measures to mitigate the adverse impacts of the loss of individual resources at Aquatic Park NHL District (stone retaining wall) CUL-2: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the Aquatic Park NHL District CUL 3: Measures to mitigate the adverse impacts of the alteration of individual resources at San Francisco Port of Embarkation U.S. Army NHL District and Fort Mason National Register Historic District CUL 4: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District

TABLE ES-3: SUMMARY OF IMPACTS AND MITIGATION (CONTINUED)

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 ACTION ALTERNATIVE	ALTERNATIVE 2A PROPOSED ACTION WITH NORTH LOOP OPTION	ALTERNATIVE 2B PROPOSED ACTION WITH SOUTH LOOP OPTION	MITIGATION MEASURES
Cultural Resources (cont.)				
				CUL-5: Measures to mitigate negligible impacts to archeological resources due to inadvertent discovery during ground-disturbing activities
Recreation and Visitor Use				
Alternative 1 would result in no impacts to recreational opportunities	Alternative 2 would result in short-term and long-term, minor, adverse impacts on recreation and visitor use in the project area	The North Loop Turnaround Option would result in short and long-term minor adverse impacts	The North Loop Turnaround Option would result in short and long-term minor adverse impacts	REC-1: If necessary, relocate the bocce ball courts to suitable location REC-2: Post signage to direct Bay Trail users of temporary re-routes. REC-3: Coordinate the Bay Trail reroutes with Association of Bay Area Governments (ABAG)
Visual and Aesthetic Resources				
Alternative 1 would result in no direct, indirect, or cumulative impacts to visual resources	Alternative 2 would result in a long-term moderate adverse impact	The North Loop Turnaround Option would result in long-term minor and moderate, adverse effects	The South Loop Turnaround Option would result in long-term minor and moderate, adverse effects	VIS-1: Install temporary visual screening during construction. VIS-2: To the extent feasible, construction staging areas shall be located to the largest extent possible away from view of public viewsheds and remain clear of all trash, weeds and debris etc. VIS-3: Signs will be limited to the minimum necessary to meet information, warning, and regulatory needs and to avoid confusion and visual intrusion.
Night Sky Visibility and Light Pollution				
Alternative 1 would result in no direct or indirect, impacts to night sky visibility	Alternative 2 would result in long-term minor impacts due to increased night lighting	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	NIGHT-1: The project would be required to minimize the use of lighting in areas already well lit and to use full cutoff light fixtures throughout the project.

Table ES-3: Summary of Impacts and Mitigation (continued)

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Geology, Soils, and Seismicity				
Alternative 1 would result in negligible impacts with respect to soil erosion and seismic or landslide events for all segments of the alternative, except for the Fort Mason Tunnel Segment, which could experience a moderate, long-term, adverse impact from dynamic settlement caused by a design-basis earthquake. This moderate impact would be reduced to minor intensity with implementation of the proposed mitigation measure(s).	Alternative 2 would result in minor adverse effects	The North Loop Turnaround Option would result in minor adverse effects after implementation of mitigation measure GEO-3.	The South Loop Turnaround Option would result in minor adverse effects after implementation of mitigation measure GEO-2.	GEO-1: Conduct further analyses to determine whether or not the tunnel is vulnerable to additional damage due to compaction of soil during an earthquake GEO-2: Slope stability evaluation and adherence to California Building Code GEO-3: Fort Mason Tunnel rehabilitation
Biological Resources				
Alternative 1 would result in no measurable change to vegetation, wildlife, or special-status species (if present)	Alternative 2 would result in negligible impacts to biological resources after implementation of the mitigation measures BIO-1 and BIO-2, construction and operation impacts	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	BIO-1: Preconstruction Nesting Bird Surveys BIO-2: Preconstruction Roosting Bat Surveys
Public Health and Safety				
Alternative 1 would result in no direct or indirect impacts to public health and safety	Alternative 2 would result in a short-term, minor, adverse impact	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	HEA-1: Pre-Construction Hazardous Materials Assessment HEA-2: Soil and Groundwater Management Plan HEA-3: Health and Safety Plan (HSP)
Public Services and Utilities				
Alternative 1 would result in no impacts to public services or utilities under this alternative	Alternative 2 would result in moderate adverse impacts	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	PUB-1: Maintain Utility Services

Chapter 1
Purpose and Need

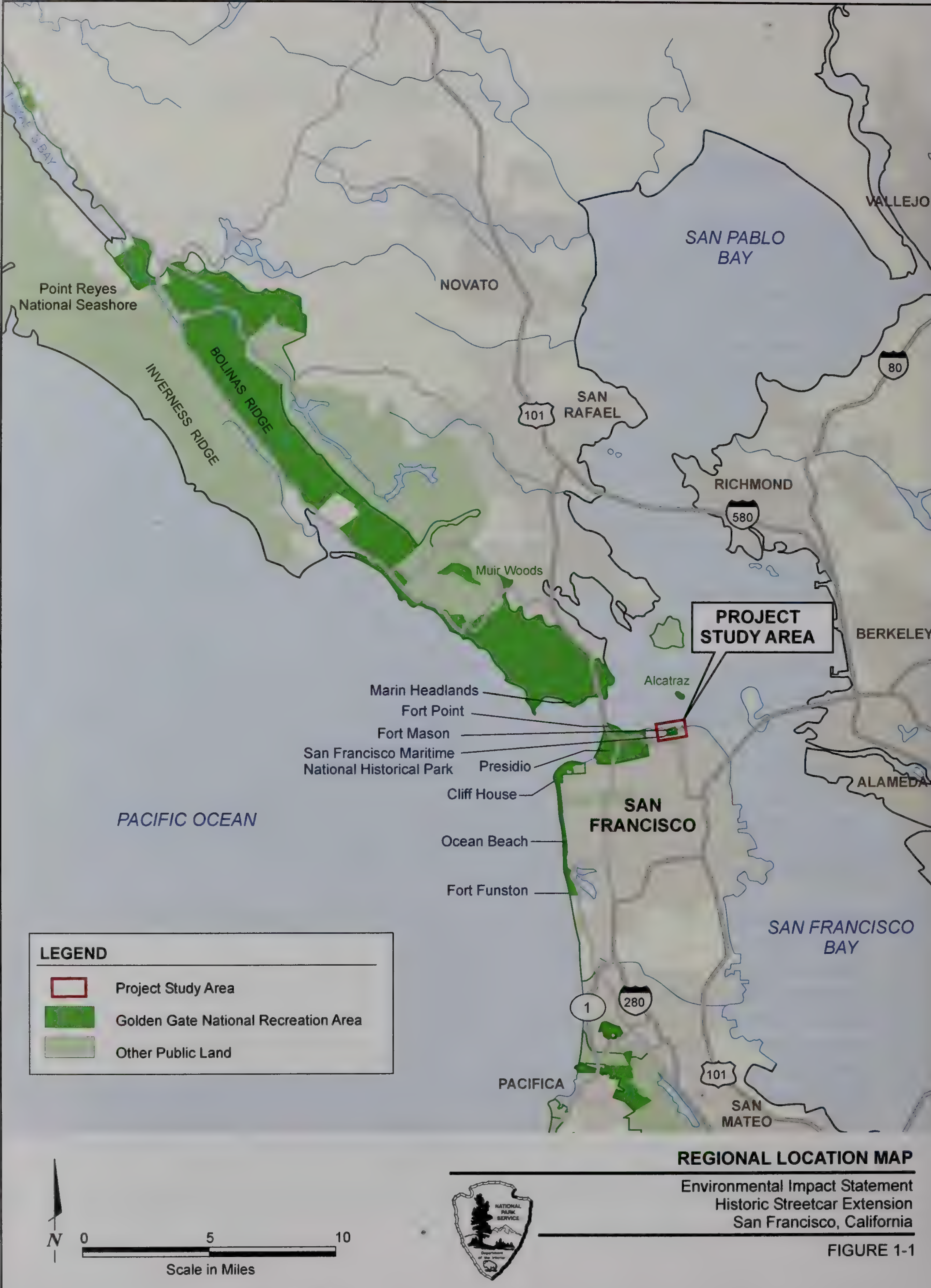
1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The National Park Service (NPS) is preparing an environmental impact statement (EIS) for an extension of the historic streetcar F-line from Fisherman's Wharf to the Fort Mason Center. The National Park Service is the lead agency and the San Francisco Municipal Transportation Agency (SFMTA) and the Federal Transit Administration are the cooperating agencies under the National Environmental Policy Act (NEPA). The proposed Project is the culmination of cooperative efforts by the National Park Service with the Golden Gate National Recreation Area and the San Francisco Maritime National Historical Park, the City and County of San Francisco, the SFMTA, and the Presidio Trust. Previous studies from these agencies showed that these urban national park destinations could benefit from improved regional and local transit connectivity. This improved service connectivity would help accommodate existing and future visitor demand. Based on those studies, conceptual approaches to address alternative transportation needs were identified and evaluated against the purpose and need of the Project, park management objectives, and operability constraints. One Action alternative (the Proposed Action) and the No Action alternative were identified to be carried forward for detailed evaluation in this Draft EIS (DEIS). This document has been prepared in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA) (42 United States Code 4321 et seq.), and *Director's Order No. 12: Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001).

The Project proposes to extend the F-Market & Wharves Line (F-line) from Fisherman's Wharf through the San Francisco Maritime National Historical Park (SF Maritime NHP) and the Golden Gate National Recreation Area (GGNRA), in San Francisco, California (**Figure 1-1**). The GGNRA and the SF Maritime NHP are two separate National Park Service units in San Francisco's northeastern waterfront; SF Maritime NHP is adjacent to the GGNRA, which includes Fort Mason. The GGNRA was established in 1972, and encompasses over 75,000 acres of land in San Francisco, Marin, and San Mateo Counties. The 50-acre SF Maritime NHP, established in 1988, includes the Maritime Museum and a Senior Center (both housed in the original Aquatic Park Bathhouse), Aquatic Park, Municipal Pier, Hyde Street Pier, and a collection of National Historic Landmark vessels.

The historic alignment of the State Belt Railroad, in use from 1889–1976, is within both parks and extends outside the study area. During the 1915 expansion of the railway, a tunnel under Fort Mason (from Van Ness Avenue to what is now Fort Mason Center) was constructed; the tunnel was closed in the 1980s and is currently part of Fort Mason, under the jurisdiction of the National Park Service. Since the 1970s a mass-transit connection to the existing local and regional transportation network has been identified as a NPS objective for the GGNRA. The congressionally mandated *1977 Golden Gate Travel Study* recommended restoring the historic State Belt Railroad link from Hyde Street Pier (now part of the SF Maritime NHP) through the tunnel at Fort Mason to improve access to NPS facilities and destinations and reduce congestion and private automobile use at the GGNRA (NPS 1977). The 1980 *General Management Plan and Environmental Analysis, Golden Gate National Recreation Area and Point Reyes* (GMP) identified management objectives that would use a transit extension to make the GGNRA available to a broad variety of park users, and use transit systems to alleviate traffic impacts



REGIONAL LOCATION MAP

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 1-1

on adjacent communities and park resources. Further, the transportation section of the GMP proposed a shuttle, possibly using historic trolley cars, connecting parklands along the northern San Francisco waterfront utilizing the State Belt Railroad right-of-way (1980:72).

In 1995, the SFMTA's Municipal Railway (Muni) began operation of historic streetcars along the F-line, along Market Street and in 2000 it was extended to Jones Street at Fisherman's Wharf (see **Figure 1-2**). Currently, the F-line serves more than 20,000 passengers a day and is one of Muni's most popular rail lines. The *1997 General Management Plan* of the SF Maritime NHP includes proposals to improve accessibility to the park by supporting related transportation proposals outlined in the *GGNRA GMP* and *Presidio Trust Management Plan*, including opening the railroad tunnel under Fort Mason and extending the F-line rail system from Fisherman's Wharf west through Aquatic Park. The San Francisco Municipal Railway *Short Range Transit Plan FY2006-2025* also identifies extension of the F-line in the Service Planning and Expansion section.

1.1.1 Project Study Area

The study area for the Project in San Francisco's northeastern waterfront is bounded by Mason Street on the east, Bay Street on the south, Fillmore Street on the west and the bay front, including the piers and parklands within the east-west boundary, on the north (Figure 1-2).

Part of the SF Maritime NHP has been designated as the Aquatic Park National Historic Landmark District (NHLD). Fort Mason—which includes the San Francisco Port of Embarkation NHLD[1]—consists of Upper Fort Mason and Lower Fort Mason. Lower Fort Mason encompasses the historic piers and buildings in which Fort Mason Center (the Center) is located (**Figure 1-3**). Fort Mason Center is a non-profit organization that is a destination for programs, events and organizations. Both the NHLDs mentioned above are in dense, urban locations that lie directly adjacent to high-density residential and commercial districts. These districts are characterized by high visitation rates, high pedestrian and automobile traffic volumes, and intense recreational and commercial use.

1.2 PURPOSE OF PROJECT

The purpose of this project is to provide park visitors and transit-dependent residents with high-quality rail transit that improves transportation access and mobility between existing streetcar service at Fisherman's Wharf and Fort Mason Center in GGNRA. The streetcar service would have connection to the regional transit rail services, while respecting the settings, context, and resources of these two national park destinations and avoiding or minimizing adverse effects to National Historic Landmarks and National Register of Historic Places (NRHP) listed or eligible properties.

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[1] The San Francisco Port of Embarkation NHLD includes all of Lower Fort Mason and only Building 201 in Upper Fort Mason.

1.3 NEED FOR PROJECT

The need for this project resulted from the following issues:

- **Inadequate Regional Transit Access to Fort Mason Center**

  Visitors traveling to Fort Mason on regional transit are required to make multiple transfers to reach their destination. For regional riders using the Bay Area Rapid Transit (BART), or regional services offered by Caltrain, access to Fort Mason frequently requires at least two transfers. Alameda-Contra Costa Transit District (AC Transit) and ferry riders must transfer at least two, and often three, times to reach Fort Mason. Multiple transfers are a deterrent to the use of regional transit to reach Fort Mason.

  Nearby transit service is depicted in **Figure 1-2** and illustrates the lack of connectivity between the Fort Mason Center and transit lines. The 28 bus line provides the closest connection to Fort Mason Center with a station at Marina Boulevard and Laguna Street; however this bus line originates in Daly City and only services the western and northern parts of San Francisco.[2] Passengers arriving near Upper Fort Mason via the 47 or 49 bus lines disembark at Van Ness Avenue and North Point Street and then walk approximately 0.6 miles along streets or a path through the Great Meadow to reach Fort Mason Center. Passengers arriving via the 30 bus line would disembark at Chestnut Street and Laguna Street and then walk approximately 0.3 miles along Laguna Street to the Fort Mason Center entrance. Visitors coming from Fisherman's Wharf take the existing F-line to Jones Street and then walk approximately 1 mile to reach the Fort Mason Center.

- **Limited Transportation Options for Transit-Dependent Residents**

  In the spirit of bringing national parks to the people, GGNRA and SF Maritime NHP reach out to, and promote the richness and breadth of the national park system to a diverse urban community, including city residents who may be experiencing a national park for the first time and who may not have access to private vehicles. One of the goals of NPS is to provide recreational and cultural facilities and destination to transit-dependent residents. Although the GGNRA and SF Maritime NHP are in the City of San Francisco (the City) and therefore closer to these residents than many other national parks, the public transportation access required by most potential park patrons continues to be insufficient, often requiring multiple transfers to reach the NPS sites along the waterfront. As noted above, multiple transfers can be a deterrent to transit use.

  Underserved populations living outside San Francisco may require transfers within their communities to reach the regional transportation network, as described above. Underserved residents living inside San Francisco are interspersed throughout most of the City. However, according to the 2006 San Francisco Mayor's Office of Community Investment *2005-2010 Consolidated Plan*, underserved areas are in the eastern and southeastern portions of the City. While most San Francisco residents generally require at least one transfer to access the parks, those living in the eastern/southeastern portion of the City may require additional transfers. For example, portions of the Bayview Hunters Point neighborhood require a minimum of two transfers to access the parks. The 1980 GGNRA General Management Plan identified the need for extension of transit service between the park and transit dependent neighborhoods (1980).

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[2] SFMTA's *Transit Effectiveness Project* recommends changes to the 28 and 28L bus line that would eliminate the bus stop closest to Fort Mason Center at Marina Boulevard. The new route would run along Lombard Street and terminate at Van Ness Avenue and North Point Street (SFMTA 2008b).

PROJECT STUDY AREA

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 1-2

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Fort Mason Center Parking Lot Detail

Aquatic Park Detail

LEGEND

- Historic Belt Railway Alignment
- Fort Mason Tunnel
- SF Bay Trail Alignment

Source: Google Earth 2008

FORT MASON CENTER PARKING LOT AND AQUATIC PARK: DETAIL

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 1-3

- **Limited Connectivity to Northeastern Waterfront Cultural and Recreational Corridor**

  Over the past 20 years, San Francisco's northeastern waterfront has been transformed from an underused industrial area to a vibrant waterfront cultural corridor stretching from AT&T Park to the Presidio. This corridor includes South Beach Marina, the Ferry Building, Pier 7, Pier 39, the Aquarium of the Bay, Fisherman's Wharf, SF Maritime NHP and Fort Mason Center. Throughout the northeastern waterfront corridor there is a high level of pedestrian activity, with visitors seamlessly moving between the commercial establishments and the NPS facilities. Many of these attractions are linked by SFMTA's historic streetcar service (the F Line), which has proven to be popular with visitors and residents alike. However, this service does not currently reach the National Park Service's recreational and historic attractions including the Hyde Street Pier, Aquatic Park, the Maritime Museum, the Municipal Pier, nor Upper and Lower Fort Mason including the Fort Mason Center.

  The facilities within Fort Mason and SF Maritime NHP are integrated into the fabric of the City, serving as an arts and cultural activity center. Many of the 14 million annual visitors to Fisherman's Wharf, a major tourist destination immediately adjacent to SF Maritime NHP, are also drawn to the neighboring national park destinations. The necessity of multiple transfers slows trips and increases the difficulty for visitors or residents unfamiliar with the local transit network. Figure 1-2 illustrates the lack of connectivity between Fort Mason Center and the northeastern waterfront.

- **Insufficient Transportation Infrastructure to Accommodate Existing and Projected Visitor Demand.**

  Fort Mason Center hosted more than 11,400[3] events in fiscal year 2009 (October 2008-September 2009), bringing approximately 1.7 million visitors to the site (FMC 2009a). **Table 1-1** shows a breakdown of projected attendance at major events hosted by the Fort Mason Center in 2010. These figures do not include regularly scheduled meetings, classes, and smaller events. Many events at Fort Mason Center are attended by thousands of visitors, with the largest events attended by 8,000 visitors (see Appendix A1 for a complete list of the major events in 2010). Other events in the area that impact the Fort Mason Center such as the Bridge to Bridge Run bring over 10,000 visitors to the area.

TABLE 1-1: FORT MASON CENTER PROJECTED ATTENDANCE FOR MAJOR EVENTS[a] IN 2010

Visitor Attendance[b]	Number of Events
0-100	88
101-500	349
501-1000	83
1001-5000	66
Over 5000	2

[a] Major events do not include the daily regularly scheduled meetings, classes and smaller events at the FMC

[b] Crowd numbers for events are estimates

Source: Fort Mason Center Parking Impact Notice, 2010.

[3] Events include classes, meetings, conferences, exhibitions and performances; many occur simultaneously each day.

Transportation access to Fort Mason Center is primarily by automobile, in part due to the inadequate regional and local transit access described above. The Fort Mason Center is served directly by only one bus line (the 28-19th Avenue) (see Figure 1-2); this line does not originate from downtown or other parts of the City frequented by visitors, and it has poor connections to regional transit lines and to local transit lines serving the rest of San Francisco. Additionally, it will have limited service to the Van Ness Avenue corridor in the future due to a bus rapid transit project on Van Ness Avenue.[4] At the Fort Mason Center, there are 446 parking spaces available. While parking volumes for this lot are highly cyclical and depend on the events occurring at the Center, the annual volume of cars for 2009 was 236,271 (FMC 2009b). This results in substantial parking problems, especially on weekends, when parking spills over into the adjacent Marina neighborhood and adjacent parking areas (Gashouse Cove and Marina Green) that are not under NPS jurisdiction. Some event organizers hire valet services or use Marina Middle School for overflow parking.

SF Maritime NHP has 4 million visitors each year. The SF Maritime NHP relies on the availability of on-street or commercial parking lots available for the Fisherman's Wharf area. The number of visitors coming to Fort Mason Center and SF Maritime NHP is expected to increase in the future. With the San Francisco Bay Area[5] population projected to grow 18.8 percent by 2030 (presently 7.3 million) (ABAG 2009), transit links will be critical to maintaining access to the Parks. The Bay Area region recognized the importance of the expansion of historic streetcar service by including it as one of the "Strategic Expansion" projects in San Francisco in the *Transportation 2030 Plan* for the San Francisco Bay Area (MTC 2005.) The planned restoration of a historic pier at Fort Mason Center will provide additional exhibition space, and the renovated Maritime Museum recently re-opened to the public. These improvements are anticipated to draw a greater number of visitors to the national park destinations, which would in turn exacerbate existing parking and traffic capacity demands.

The *Fort Mason Center Long-Term Lease Environmental Assessment* projects an increase in visitor levels to the Fort Mason Center by 14.5 percent contingent upon the renovations of Pier One, which is currently not used as an event space. If Pier One was restored, the 2003 Environmental Assessment (EA) projected that the 1.6 million annual visitors would be increased to 1.9 million for the entire Fort Mason Center. The EA also predicts that the increase in visitors from the development of Pier One could increase transit demand.

The 2007 *Fort Mason Center Employee Survey* (URS 2009f) concluded that approximately 17 percent of Fort Mason Center employees currently arrive at work by transit and that 48 percent of employees noted they would have taken the F-line if it already served Fort Mason directly. Similarly, the 2007 *Fort Mason Intercept Survey* (URS 2009f), which surveyed 729 visitors to Fort Mason Center found that approximately 11-14 percent of current visitors reported that they took transit to Fort Mason and 45 percent of visitors said that they would have taken the F-line if it already served Fort Mason Center.

NPS goals for transportation in the GGNRA include the reduction of automobile-based trips for recreational travel, and inter- and intra-park transportation networks coordinated with existing transportation systems (NPS 1980). The *San Francisco Maritime National Historical Park Climate Change Action Plan* (NPS 2010a) and the *Golden Gate National Recreation Area*

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4 The Van Ness Avenue Bus Rapid Transit (BRT) Project would implement transit improvements along the Van Ness Corridor from Mission Street to Lombard Street.

5 Bay Area region includes the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma (ABAG 2009).

Climate Change Action Plan (NPS 2008b) both seek to reduce fuel consumed by visitors by maximizing transportation options in the parks and providing linkages to public transportation systems. This is particularly desirable, appropriate, and feasible at dense, urban national parks such as SF Maritime NHP and GGNRA, where existing public transit infrastructure can be extended at a reasonable cost.

- **Infrastructure Constraints Impacting Effectiveness and Operations of Fort Mason Center**

  Fort Mason Center, a non-profit organization within the National Historic Landmark, is a destination for programs, events and organizations. It is an international model for an urban park setting which preserves historic buildings for uses consistent with and related to the mission of the National Park Service and GGNRA.

  Fort Mason Center hosts numerous expositions, conferences, and events throughout the year; however, the closest hotels are in the Fisherman's Wharf area and along Lombard Street and Van Ness Avenue. The lack of a direct transit connection between the hotels in the Fisherman's Wharf area and Fort Mason Center limits the potential of the center as an event destination. With better transit, Fort Mason Center would also function better as a conference/meeting location. The lack of direct transit limits the number of transit-dependent visitors who participate in activities at the center, and may be a deterrent to others who avoid the area due to roadway congestion and difficulty of parking. Furthermore, the lack of transit to the Center directly contributes to roadway congestion along Marina Boulevard which is a direct link to the Golden Gate Bridge. Its unique position as a large multi-use venue offers a tremendous opportunity to benefit businesses and nonprofit organizations as well as 1.7 million visitors per year.

  Under the lease terms with the National Park Service, Fort Mason Center has a financial obligation to assist with funding historic preservation and rehabilitation of all of the buildings and amenities on the campus. Funds to support operations are generated by tenant rentals at the Center, including a restaurant, a café, art galleries, non-profit organizations, and museums. Additional revenues are generated by visual, performing and literary arts events, large and small expositions, conferences and meetings. Funds for rehabilitation and restoration of the Center will be derived from financing supported by these revenues. Major funding is also derived from the philanthropic community which supports the Center's programs.

1.4 PROJECT OBJECTIVES

Project objectives are specific statements of purpose that relate to the need for the Project. A project's success can be evaluated based on whether it has successfully achieved its objectives. Objectives also provide the basis for creating the evaluation criteria used in the screening of a reasonable range of project alternatives (refer to Chapter 2. Alternatives). The objectives for this project are to:

- Increase regional access and decrease automobile-based trips to SF Maritime NHP and GGNRA
- Create and/or enhance transit connections to SF Maritime NHP and GGNRA for transit-dependent populations
- Provide direct transit service connecting SF Maritime NHP and Fort Mason Center with the recreation and cultural corridor along the northeastern waterfront, which would fill an existing gap in SFMTA's current service network

- Enhance the ability of Fort Mason Center to offer events, to provide increased funding support for GGNRA historic preservation efforts
- Offer park visitors and employees an attractive energy-efficient mass transit transportation alternative
- Avoid or minimize adverse effects to the NHLDs and NRHP-listed or eligible properties, and maintain the integrity of related cultural and historic resources
- Maintain the natural, scenic, and recreational values of SF Maritime NHP and GGNRA
- Create a transit link between the hotel facilities at Fisherman's Wharf and the conference facilities at Fort Mason Center

1.5 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

This project is focused on providing park visitors and transit-dependent residents with high-quality rail transit that improves transportation access and mobility between existing streetcar service at Fisherman's Wharf and SF Maritime NHP and the Fort Mason in GGNRA, with connection to the regional transit rail services. It will not make decisions on other mass transportation alternatives, transit links beyond Fort Mason or projects on San Francisco property.

The EIS evaluates impacts for the entire Project area (including non-federal lands), but in a NEPA framework. This project has been exempted from the California Environmental Quality Act (CEQA). In 1985, the San Francisco Planning Department issued a "Certificate of Determination of Exemption/ Exclusion from Environmental Review" for construction and operation of an E–Embarcadero Streetcar Line project between the Ferry Building and the west end of the Fort Mason Tunnel. The certificate was issued pursuant to a Statutory Exemption from CEQA for rail extension projects of under 4 miles in length, as specified in state law. This CEQA exemption was updated and reissued by the Planning Department, City and County of San Francisco on April 28, 2006 (SF Planning 2006).

1.5.1 Impairment of Resources and Values

The NPS Organic Act of 1916 prohibits the impairment of park resources and values. The NPS Management Policies 2006 define impairment as: an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. A written impairment determination will be made for the preferred and selected alternative. A draft impairment determination is located in Appendix G.

1.6 PARK PURPOSE AND SIGNIFICANCE

1.6.1 National Park Service Mission

The primary responsibility of the National Park Service is to ensure that park resources and values will continue to exist in an unimpaired condition that will allow people to enjoy them now and in the

future. The National Park Service Organic Act of 1916 and the General Authorities Act of 1970 are the foundation for this mission. These acts prohibit impairment of park resources and values. The 2006 NPS Management Policies use the terms "resources and values" to mean the full spectrum of tangible and intangible attributes for which the park is established and managed, including the Organic Act's fundamental purpose and any additional purposes as stated in the park's establishing legislation.

The evaluation of whether impacts of a proposed action would lead to an impairment of park resources and values is included in this EIS. Impairment is more likely when there are potential impacts to a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

1.6.2 National Park Sites in the Project Study Area

Golden Gate National Recreation Area. Congress established the GGNRA in 1972 under Public Law 92-589 with the purpose:

> *...to preserve for public use and enjoyment certain areas of Marin and San Francisco Counties, California, possessing outstanding natural, historic, scenic, and recreational values and...to provide for the maintenance of needed recreational open space necessary to urban environment and planning...* (Pub.L. 92-589, § 1, Oct. 27, 1972, 86 Stat. 1299).

This mandate to preserve the varied resources of the park for public use and enjoyment is significant in that it provided "an unprecedented opportunity to make national park resources and programs available to a wide variety of (urban) visitors, many of whom had not been reached by the more remote national parks" (NPS 1980). The GGNRA comprises a diverse collection of properties in three counties (now including San Mateo County) that range from bay and ocean shoreline to historic sites such as Alcatraz Island.

The former United States (U.S.) Army post at Fort Mason was incorporated into the national park system when GGNRA was established in 1972. Fort Mason is a Historic District and the San Francisco Port of Embarkation NHLD is within Fort Mason. Fort Mason is separated from SF Maritime NHP and Fisherman's Wharf by steep bluffs that form the eastern edge of Fort Mason and limit access between SF Maritime NHP and the Fort Mason Center.

Fort Mason consists of both Upper and Lower Fort Mason. Upper Fort Mason is at a higher elevation, and includes the Great Meadow and the headquarters of the GGNRA. Lower Fort Mason houses the administrative offices of SF Maritime NHP, including the headquarters offices, library and collections

and the Fort Mason Center,[6] which is administered by the non-profit organization also named Fort Mason Center under the terms of a long-term lease with National Park Service. The Center's Mission is:

> *To create and preserve a cultural, educational and recreational center that reflects the unique history, talents and interests of the people in the Bay Area, in partnership with the National Park Service*

Fort Mason Center is northeast of Marina Boulevard and Great Meadow. The entrance to Fort Mason Center is at the intersection of Marina Boulevard and Buchanan Street, adjacent to the high-density residential Marina district neighborhood of San Francisco, and associated commercial use close to the Center's entrance. As has been stated, Fort Mason Center is an important venue in the City for performances, conferences and exhibitions. **Photo 1-1** provides an overview of the Fort Mason Center (Lower Fort Mason).

Photograph 1-1. Fort Mason Center

San Francisco Maritime National Historical Park. SF Maritime NHP was established in 1988 as a distinct national park unit, incorporating such existing elements as the 1936 Aquatic Park Bathhouse (housing the Maritime Museum and San Francisco Senior Center), Aquatic Park, Hyde Street Pier, and the historic ship collection acquired by the National Park Service in 1978. **Photo 1-2** provides an overview of the Maritime Museum from Van Ness Avenue, including a portion of the former State Belt Railroad trackage. SF Maritime NHP's boundaries abut Fort Mason and include portions of Van Ness Avenue, Jefferson Street and Hyde Street. The SF Maritime NHP's mission is as follows:

> *San Francisco Maritime [NHP], with its partners, seeks to forge emotional and intellectual connections though preservation and interpretation of the resources and stories of America's maritime gateways, history, and culture, especially the development of the Pacific Coast. We maintain and make available the park's assets to enrich the lives of multiple communities and users.*

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[6] The following organizations are tenants at the Fort Mason Center: Animal Switchboard; Arts Arbitration & Mediation Services; BATS Improv; Blue Bear School of Music; Book Bay Bookstore; California Lawyers for the Arts; Chinese Cultural Productions; City College of San Francisco; Cooks & Company; Environmental Traveling Companions; Greens Restaurant; Long Now Foundation; Magic Theater; Mexican Museum; Museo ItaloAmericano; On the Commons; Ploughshares Fund; SF Children's Art Center; SFMOMA Artists Gallery; SF Maritime National Historical Park; World Arts West; Young Performers Theater.

Photograph 1-2. Maritime Museum

The significance of SF Maritime NHP is found in the museum and collections and the fleet of NHL vessels. Aquatic Park features historic structures and settings associated with the history of the Bay and Black Point, such as the Aquatic Park Historic District (which includes the Maritime Museum and associated public artwork, bleachers, concession stand and restroom buildings, east/west speaker towers, seawall and promenade, WWII army landing pier, integrated landscape portions of Aquatic Park, and the Aquatic Park Lagoon and Beach). The NHL nomination describes San Francisco's Aquatic Park as having "national significance in architecture and landscape architecture because of its outstandingly thorough and masterful design. The buildings and site are outstanding examples of Streamline Moderne. The park has no architectural parallel on the west coast, and although on a smaller scale, it rivals the design quality of portions of Miami Beach, famous for its Deco and Moderne buildings."

1.7 RELATED PLANS AND STUDIES

The Project is informed by the following studies and in conformance with approved plans and policies.

1.7.1 National Park Service Studies

Golden Gate Recreational Travel Study. In the 1970s, Congress mandated that the newly formed GGNRA conduct a Travel Study to investigate access issues to the new urban national park. The 1977 *Golden Gate Recreational Travel Study* identified environmental impacts, social impacts, and system goals

(NPS 1977). One of the recommendations from this study was that the State Belt Railroad right-of-way extending from Fisherman's Wharf through the Fort Mason Tunnel, should be used for transit. The study also found that recreational transit could play a large role in meeting the demand of transit dependent groups, including low-income populations.

Fort Mason Tunnel Studies. In 2005, the National Park Service conducted an evaluation to determine the structural deficiencies of the tunnel, and to assess the feasibility of rehabilitating the Fort Mason Tunnel for use by the future streetcar extension (Kleinfelder, Inc. 2005). The purpose of the study was to characterize the current condition of the tunnel and portal retaining structures and to develop concepts for rehabilitating these facilities for streetcar use. This study also included a geotechnical and seismic examination of the Fort Mason Tunnel. The study found that rehabilitation and strengthening of the tunnel would be needed due to voids behind the tunnel lining, water infiltration inside the tunnel, large cracks in the interior lining, and potential instability of the slope above the east portal. The report noted that the tunnel itself was not subject to earthquake damage from liquefaction or lateral spreading. In 2005, the National Park Service conducted an additional study to investigate methods for conducting the rehabilitation of the tunnel and estimate costs for the work (Jacobs Associates 2005). The study recommended preliminary construction scope, methods and costs. The 2004 study estimated costs for the tunnel work to be approximately $12.2 million, of which $5.2 million were estimated to be for streetcar track and systems, and approximately $7 million for tunnel rehabilitation work required to preserve the historic tunnel and prevent failure that would disturb land and buildings above the tunnel.[7]

1.7.2 National Park Service Plans

GGNRA General Management Plan. The GGNRA's *1980 General Management Plan* established management objectives to ensure that the park's purpose was fulfilled. These consisted of preservation and restoration of natural and cultural resources, making the recreation area readily available to the broadest variety of park users, provision of a broad variety of park experiences, and consideration of park neighbors. The plan identified the pursuit of transit extension between the park and transit dependent neighborhoods, and the use of transit systems to alleviate traffic impacts on adjacent communities and park resources. Furthermore, the plan identified the improvement of transit service to the park, and the provision of transit service within the park. The plan also identified the potential to use historic San Francisco trolley cars traveling along the existing State Belt Railroad right-of-way. The National Park Service is currently updating the 1980 GMP; the update is estimated to be complete in 2012.

GGNRA Strategic Plan, Fiscal Year 2008–2012. The *Strategic Plan for the Golden Gate National Recreation Area (Fiscal Year [FY] 2008–2012)* documents long-term goals that detail the actions and projects that National Park Service will accomplish towards meeting the overall park mission and associated goals. As part of its goal to increase overall visitor satisfaction with appropriate park facilities, services, and recreational facilities, the National Park Service has identified improving access options to GGNRA. One of the major transportation plans included in the strategic plan to further this goal is the extension of historic streetcar lines to Fort Mason.

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[7] Cost estimates for tunnel rehabilitation without rail for 2011 are: $750,000 for design, $9.2 million for construction; $1,380,000 for construction management.

Statement for Management. The 1992 *Golden Gate National Recreation Area Statement for Management* reiterated the importance of public access and public transportation. This statement for management identified the following management objectives: to provide alternative public transportation services as proposed in the GMP; to alleviate traffic impacts on adjacent communities and on park resources by promoting and encouraging visitor and employee use of public transportation; and to design and implement transportation plans to effectively manage the safe flow of traffic (1992).

SF Maritime NHP General Management Plan. The *1997 General Management Plan* of the SF Maritime NHP includes proposals to improve accessibility to the park by supporting related transportation proposals outlined in the *GGNRA GMP* and *Presidio Trust Management Plan*. These proposals include "opening the railroad tunnel under Fort Mason as an access to the maritime park from the Marina District and Presidio and extending the F-line rail system from Fisherman's Wharf west through Aquatic Park…" (NPS 1997).

Fort Mason Center Long-Term Lease Environmental Assessment. The purpose of this document, prepared in August 2003, is to allow the continued operation of the Fort Mason Center to meet the objectives identified in the Fort Mason Foundation's mission statement and the 1980 General Management Plan: to create and preserve a cultural, educational, and recreational center, which reflects the unique history, talents, and interests of the people of the Bay Area in partnership with the National Park Service (EIP et al. 2003)

The San Francisco Maritime National Historical Park Climate Change Action Plan (2010). The Climate Change Action Plan identifies steps that San Francisco Maritime National Historical Park can undertake to reduce greenhouse gas (GHG) emissions and adapt to the current and future impacts of climate change. The plan presents the Park's emission reduction objectives, and associated reduction actions to achieve the Park's goals.

The Golden Gate National Recreation Area Climate Change Action Plan (2008). The purpose of this plan is to provide a guide for the GGNRA to become a carbon neutral park and to adapt to changes the Park may experience due to a changing climate. The Action Plan is a planning-level document that lays out the principles and process by which the Park will adapt to climate change and reduce its net emissions of greenhouse gases (GHGs) (including those of its visitors) to the point that it is no longer a contributor to global warming. This plan will be implemented through annual plans that select actions and projects to pursue each year to achieve the overall goal of carbon neutrality by 2016.

1.7.3 Related Studies

2004 Muni E-Line[8] Extension Feasibility Study. In December 2004, the Presidio Trust completed the *Muni E-line Extension Feasibility Study*, which examined the feasibility of extending the yet-to-be-

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[8] The E-line (also known as the E-Embarcadero Line) is identified in the SFMTA FY2008-FY2027 *Short Range Transit Plan* as a historic streetcar line that is proposed to run along the length of The Embarcadero using the existing F-line track between the Caltrain Terminal at Fourth and King Streets and the existing F-line terminus at Jones Street (Fisherman's Wharf). This project uses the term F-line extension since the E-line has not been developed. In the future, the extension proposed in this project from Fisherman's Wharf to Fort Mason Center may be a part of the E-line.

implemented E-line historic streetcar line from Fisherman's Wharf to Fort Mason Center using the Fort Mason Tunnel. San Francisco Municipal Railroad, SF Maritime NHP, and GGNRA were participating agencies in the study, which evaluated the potential effects of multiple alignment options on engineering, transit operations, land use, ridership potential, traffic, parking and circulation impacts and cultural resources.

1.7.4 Related Plans

In addition to NPS plans, the extension of historic streetcar service to Fort Mason has been identified or addressed in a variety of other local plans since the 1970s.

SFMTA 5 Year Plan 1977-1982. As early as 1977, SFMTA identified rail service along the Embarcadero, using upgraded State Belt Line Railroad infrastructure. The *5 Year Plan 1977-1982 Muni Metro: Issues and Strategies* issue paper identified a proposed line extending "along the waterfront to Fisherman's Wharf and perhaps Fort Mason" (1970).

SFMTA 1979 Short Range Transit Plan. As envisioned, in the 1979 Short Range Transit Plan (SRTP), historic and vintage streetcars would one day operate between the Caltrain Terminal at its southern end and Fort Mason Center at its northern end, via the Embarcadero (identified in the plan as the E-line). Tracks would be shared on the southern Embarcadero with the Muni Metro operation, and on the northern Embarcadero with the F-Market line.

1984 I-280 Transfer Concept Program EIR. The Interstate 280 (I-280) Transfer Concept Program was a comprehensive planning process developed jointly by Caltrans and the City and County of San Francisco. This process was mandated once San Francisco chose to cancel construction of I-280 north of King and 3rd Streets and decided instead to seek funding for replacement projects as part of the Interstate Transfer Program, which allowed local jurisdictions to substitute public transit or surface roadway projects for cancelled Interstate Highway projects. The 1984 I-280 Transfer Concept Program Environmental Impact Report (EIR) examined a variety of potential projects, including construction of a new historic streetcar line. The EIR included alternatives for the historic streetcar line that would extend along the Embarcadero to Fort Mason.

SFMTA 2000 Preliminary E-Embarcadero Line Operating Plan. In 2000, SFMTA prepared the Draft *Preliminary E-Embarcadero Line Operating Plan* for the E-line starter operation. This plan identified a basic E-line service from Fourth and King Streets, extending along the Embarcadero, terminating in Fisherman's Wharf. Additionally, SFMTA identified potential extension options for the future line- one of which was to Fort Mason.

2004 San Francisco Countywide Transportation Plan. The 2004 San Francisco County Transportation Authority (SFCTA) Countywide Transportation Plan identified the extension of historic streetcar service from Fisherman's Wharf to Fort Mason as a transit enhancement project that is eligible for $5 million in transportation funds approved through the 2003 voter approval of Proposition K.

2005/2008 Metropolitan Transportation Commission Transportation Plans. The 2005 *Metropolitan Transportation Commission [MTC] Final Transportation 2030 Plan* presented a list of key

investment projects and programs that expand the Bay Area region's transportation network and enhance mobility and accessibility for transit users. One of the identified projects listed in the plan is for the expansion of historic streetcar service. In December 2008, the MTC released the Draft Transportation 2035 Plan: *Change in Motion*. One of the projects listed in this plan is the extension of streetcar service from Fisherman's Wharf to Fort Mason. The MTC adopted the *Transportation 2035 Plan for the San Francisco Bay Area* on April 22, 2009. Under projects listed for San Francisco County, this plan includes extending streetcar service from Fisherman's Wharf to Fort Mason.

2006/2008 SFMTA Transit Effectiveness Program (TEP) and Enhanced Plan. The SFMTA Transit Effectiveness Program (TEP) was established in 2006 to provide a top-to-bottom review of the SFMTA transit system and to offer recommendations on improving reliability, reducing travel delay, and updating routes to more efficiently meet the transit needs of San Francisco. In 2008, the SFMTA Board of Directors endorsed TEP staff recommendations, which include initiating basic E-line service between the Caltrain Station and Fisherman's Wharf. In September of 2008, SFMTA released an Enhanced TEP, which serves as a "roadmap for the SFMTA to grow Muni service." The enhanced TEP identifies the extension of historic streetcar service (either as an extension of the existing F-line or as part of a future E-line) to Fort Mason to benefit residents and visitors.

2006 and 2007 SFMTA FY Short Range Transit Plan. In 2006, the Municipal Transportation Agency Board of Directors adopted the FY2006-FY2025 Short Range Transit Plan [SRTP]. The proposed project is included in this plan, which identifies the proposed historic streetcar extension as a precursor to a future E-line operation or as an extension of the existing F-line. In 2007, SFMTA released the Draft FY2008-FY2027 Draft Short Range Transit Plan for public review. This plan includes the extension of historic streetcar service to Fort Mason as identified in the FY2006-FR2025 SRTP.

San Francisco General Plan: Northeastern Waterfront Area Plan. The study area is partially included in the current Northeastern Waterfront Area Plan element of the *San Francisco General Plan* (as amended 07/31/2003), and specifically in the Fisherman's Wharf Subarea which extends from Municipal Pier to Pier 39. This plan includes policies that address transit and connectivity including:

- **Policy 7.3.** Connect the recreation and open space facilities of the Northeastern Waterfront with those of the Golden Gate National Recreation Area.
- **Policy 14.5.** Facilitate access into and within the Fisherman's Wharf area by transit through the provision of exclusive rights-of-way and other preferential treatment, through the extension of additional transit lines, improving frequency, speed, hours of operation, and providing clearly identified loading areas and routes. Establish a rail/bus transit line on Jefferson and Beach Streets, providing access to the Ferry Building and the South of Market area.
- **Policy 31.3.** Provide rail transit service in an exclusive transit way from Fort Mason to the Southern Pacific Depot. An extension of Market Street surface rail, the F-line should operate north of Market Street; the vehicles should be historic in character in order to provide a special waterfront transit identity. South of Market Street the transit service should be a surface extension of the MUNI Metro. Allow for continuous rail transit service along the length of the waterfront.

1.8 SCOPING FOR THE EIS

Scoping is an early and open process to determine the scope of environmental issues and alternatives to be addressed in a planning document in accordance with NEPA and Director's Order No. 12. To focus the analysis for this DEIS, the National Park Service identified specific issues (also called "Impact Topics"). Issues were selected for analysis through internal scoping with NPS staff, cooperating agencies, and public scoping as described below. Refer to Chapter 5. Consultation and Coordination for additional information on public and agency involvement.

1.8.1 Public Involvement

The Notice of Intent (NOI) for the Project was published in the Federal Register on March 29, 2006. The NOI announced the preparation of an EIS by the National Park Service, as the federal lead agency. The NOI also provided information on Project issues and potential impacts and invited comments, questions, and suggestions on the scope of the EIS during the 60-day public scoping period, which ended on May 29, 2006. Postcards notifying the public of the commencement of the planning process were sent to approximately 4,000 individuals; the mailing list was developed from GGNRA, SF Maritime NHP, and SFMTA databases. A half-page ad announcing the public scoping meeting and requesting input was placed in the *San Francisco Examiner* on May 3, 2006, and a legal notice was posted in the *San Francisco Chronicle* on May 6, 2006. Public and agency scoping meetings were held on May 9, 2006 at the Fort Mason Officer's Club in San Francisco. A meeting with the NPS and the cooperating agencies was held from 2:00 p.m. to 4:00 p.m. and the public meeting was held from 6:00 p.m. to 9:00 p.m.

During the scoping period, the National Park Service received 101 comments from individuals, organizations representing environmental, conservation and recreational interests, and governmental agencies. The primary environmental concerns focused on changes in traffic and parking, impacts on parklands and recreational facilities, noise and vibration, visual impacts, and cultural resources.

Input was also solicited from the National Park Service Historic Streetcar Extension Technical Advisory Committee (TAC), which consists of members of GGNRA, SF Maritime NHP, SFMTA, Fort Mason Center, Market Street Railway, San Francisco County Transportation Authority, Golden Gate National Parks Conservancy, San Francisco Recreation and Park Department, and the Federal Transit Administration (FTA). NPS staff with expertise on park resources were also consulted. After the initial scoping period, the National Park Service continued to update the public about the Project during the park's quarterly open houses.

1.8.2 Concerns and Issues

During the scoping period, the National Park Service received 101 comments, 77 of which were written and the remainder heard and transcribed at the public scoping meeting. A total of 69 comments came from individuals not affiliated with any group. Organizations, particularly those representing environmental, conservation, and recreational interests, submitted 20 comments. Governmental agencies provided 12 comments. In general, the comments were divided into three categories:

- Support for the Project
- Environmental issues that needed to be addressed in the EIS
- New alternatives or recommended alternatives

Forty-eight comments supported the Project and five were in opposition. A plurality of comments regarding a recommended alternative favored the streetcar alignment operating with two tracks on Beach Street (Originally called Option 3 in the Feasibility Study, this later became the preferred alternative alignment). Thirty-one comments suggested new alternatives, including extensions of existing diesel and trolley bus routes into Fort Mason, should be studied. The primary environmental concerns focused on traffic and parking (31 comments), parklands and recreational facilities (22 comments), and noise and vibration (22 comments). Between 10 and 20 comments identified MUNI operational issues and visual and cultural resource concerns.

Comments received regarding the alternatives presented during the scoping period supported one or more of the alternatives presented. Additionally, a number of comments suggested new alternatives, including extensions of existing diesel and trolley bus routes to Fort Mason. A total of six more alignment alternatives and seven turnaround alternatives were developed as a result of the comments received during the public scoping period. This included consideration of other transit modes such as diesel bus and trolley coach. Four additional turnaround alternatives were subsequently developed during the Project's TAC meetings.

1.8.3 Impact Topics Selected for Detailed Analysis

The following issues and concerns were raised during the scoping process and selected for detailed analysis. Rational for selection of each impact topic was based on potential for substantive impact; environmental statues, regulations, and executive orders; and/or NPS management policies and guidance.

- **Land Use:** The majority of the study area is urbanized, and the proposed alignment for the build alternative is predominantly located within existing transportation corridors. However, if implemented, the Project could result in the conversion of open space or park/recreational areas to transportation use in the Transition Segment and in the Great Meadow of Fort Mason, dependent on the design option selected. Portions of the Project area are within the San Francisco Bay Conservation and Development Commission (BCDC) shoreline band jurisdiction (100 feet inland from the shoreline around San Francisco Bay); the Project could impact public access to the bay and its shoreline. According to the BCDC, the Project would require a BCDC permit, and a consistency determination in accordance to the requirements of the federal Coastal Zone Management Act and the Coastal Management Program (BCDC letter dated June 12, 2006).

- **Socioeconomics:** The Project could stimulate economic activity along the northeastern waterfront and within the Fort Mason Center.

- **Transportation and Circulation**: Design of the system needs to be consistent with SFMTA's operational needs and engineering standards and function as an effective component of the City's transit system. Implementation of the extension may affect operations on existing

portions of the streetcar system. Implementation of the Project may affect the number of traffic lanes available for general traffic circulation in the Project study area. The Project would also reduce automobile trips, reducing traffic congestion. Implementation of the Project may eliminate existing parking spaces in the study area. The Project may include changes to existing bicycle and pedestrian paths in the study area.

- **Air Quality:** The study area is in an area that does not meet National Ambient Air Quality Standards for the federal $PM_{2.5}$ 24-hour standard (particulate matter with a diameter of 2.5 micrometers or less). Therefore, the Project must be analyzed for transportation conformity.
  - *Greenhouse Gas Emissions*: The proposed extension would extend a zero-local emission streetcar system; the electricity for which is a non-polluting source of renewable energy. A potential benefit of the Project would be the provision of an electric transit option for thousands of visitors who currently drive to the National Park destinations. The Project could impact vehicular traffic patterns and levels of service on adjacent city streets.
- **Noise and Vibration:** As the study area includes natural, cultural, residential and commercial uses, noise and vibration from the streetcar's operation may be a concern for park visitors, local residents and business owners.
- **Cultural Resources**: The study area includes three designated NHLDs (Aquatic Park; San Francisco Port of Embarkation; and San Francisco Cable Cars). Projects implemented in these districts must consider the preservation of their historic sites, structures, and other resources. Numerous NRHP-listed or eligible properties are also present in the study area. The National Park Service must avoid or minimize adverse effects to these properties. Cultural resource topics to be analyzed include: cultural landscapes; historic structures; and archeological resources. Cultural resource effects will be taken into account under Section 106 of the National Historic Preservation Act in consultation with the California State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP).
- **Recreation and Visitor Use:** When the GGNRA was established, recreation was among the purposes identified in the legislation (§ 460bb). The GMP and Development Concept Plan (DCP) for the park identify goals for recreation and visitor use, as well as the related facilities to support these uses. The Project would impact existing access for recreational and visitor use to the NPS facilities in GGNRA and SF Maritime NHP. The impact of the Project on park operations is considered in this section as well as Public Health and Safety.
- **Visual and Aesthetics Resources:** There has been concern that the proposed streetcar service would include overhead wires for power distribution and traffic signals at intersections. Visual resources within the Project area could be altered by facilities being constructed or removed.
- **Night Sky Visibility and Light Pollution**: The Project would introduce new night lighting sources at station platforms and along the alignment.
- **Geology, Soils and Seismicity:** The Project would be predominately in areas that currently or previously have supported developed facilities. Existing soil strata could be altered or removed and land contours could be changed as a result of construction and demolition activities. The study area lies within the right-lateral San Andreas fault system, and re-use of historic infrastructure may require seismic retrofitting.

- **Biological Resources:** No threatened or endangered species, or designated critical habitat, have been reported in the study area. However, the Project area provides potential suitable habitats for special-status species including protected bat species; birds of prey; and birds protected under the Migratory Bird Treaty Act (MBTA). The Fort Mason Tunnel provides potential suitable roosting habitat for special-status bat species. For example, day and night roosts for pallid bats include crevices in caves, mines, and various human structures such as bridges, barns, and human-occupied as well as vacant buildings, besides rocky outcrops cliffs, and trees. Trees within, and in the vicinity of, the Project area could be used by birds protected by the MBTA, for nesting and foraging. The Project could impact special-status species or habitat used by these species.

- **Public Health and Safety:** A preliminary review of federal, local, and state databases for hazardous materials, and historic maps and documentation identifies potential hazardous materials concerns within the study area. The impact of the Project on park operations is considered in this section as well as Recreation and Visitor Use.

- **Public Services and Utilities**: This section reviews the infrastructure and services needed to support operation of the proposed historic streetcar extension.

1.8.4 Impact Topics Dismissed from Detailed Analysis

The following issues and concerns would not be affected, or would be affected negligibly by the alternatives; therefore, these topics have been dismissed from detailed analysis:

- **Energy Requirements and Conservation Potential:** The Council on Environmental Quality requires that an environmental impact evaluation include an assessment of the effects of the proposed activity on energy consumption and energy conservation. The Project would include streetcars powered by a traction power system. This electric traction power system consists of a substation and underground feeders in duct banks that provide power between the substation and the extension. According to SFMTA staff, the nearest SFMTA substation (Marina Station, 1575 North Point Street, San Francisco) is in the study area, and has spare capacity that could be used to provide power for this extension. If implemented, the proposed action would require a maximum draw of approximately 3300 amps, resulting in a voltage draw of 912 kw; this would be a negligible increase in the overall draw of the SFMTA traction power system from light rail vehicles and trolleys (84,194,369 kwh). According to the SFMTA's 2008 *Climate Action Plan*, the SFMTA fleet of historic streetcars is zero-local emission; the electricity for these vehicles is generated from a San Francisco hydroelectric power plant, a non-polluting source of renewable energy. Construction activities associated with the proposed action, if implemented, would be undertaken in an energy efficient matter. Although use of the electric streetcars would be expected to assist in reducing or offsetting vehicle based trips to Fort Mason the potential for the proposed action to result in measurable net energy conservation as a result of transit trips replacing automobile use is negligible. Energy consumption related to transportation within the study area is negligible when compared to the entire region. Therefore this topic was dismissed.

- **Environmental Justice**: Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations") requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs

and policies on minorities and low-income populations and communities. According to the Environmental Protection Agency (EPA), environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. The Project would be beneficial for low income populations by improving public transportation opportunities for transit-dependent groups. The alternatives would not have disproportionate health or environmental effects on minorities or low income populations or communities as defined by the Environmental Protection Agency; therefore, this topic was dismissed.

- **Floodplain Management:** E.O. 11988, Floodplain Management, requires all federal agencies to take action to reduce the risk of flood loss, to restore and preserve the natural beneficial values served by floodplains, and to minimize the impact of floods on human safety, health, and welfare. According to the San Francisco General Plan Community Safety Element (revised 1997), "San Francisco is not subject to flooding of natural waterways (The National Flood Insurance Program, which designates flood-prone areas, has identified no areas in San Francisco)." More recently The Pacific Institute published maps of 100 year flood inundation for California, incorporating 1.4 meter of sea level rise (Pacific Institute 2009). While there is some evidence of inundation within the San Francisco Bay shoreline, these maps show this inundation to be outside of the project area. Therefore, this topic was dismissed.

- **Indian Trust Resources:** Department of Interior Environmental Compliance Memorandum 95-2 requires the National Park Service to address environmental impacts of its proposed actions on Indian Trust Resources. Indian trust resources are those assets owned by Native Americans but held in trust by the United States. Since the lands in the study area are not trust resources, this topic was dismissed.

- **Prime and Unique Agricultural Land:** The Farmland Protection Policy Act was established to minimize the conversion of prime and unique farmland, and farmland of statewide or local importance, to nonagricultural uses, and to ensure that federal programs are compatible with state, local, and private programs and policies to protect farmland. The Act does not apply to projects already in urban development; all soils within the study area have been classified as urban land by the National Resources Conservation Service; therefore, this topic was dismissed.

- **Cultural Resource Topics:** The National Park Service dismissed further evaluation of ethnographic resources (including sacred sites) and museum objects because these resources are not found in the Project study area. However, tribal consultation is ongoing for other aspects of the Project.

- **Sea-Level Rise**: According to several reports released in 2009, global warming is expected to result in a predicted sea-level rise in San Francisco Bay of 16 inches by 2050, and a sea-level rise of up to 55 inches (1.4 meters) by 2100 (BCDC 2009; Pacific Institute 2009). Increases in sea level are anticipated to result in a variety of local impacts, such as erosion of beaches, bay shores, and tidally influenced river deltas; increased flooding and erosion of marshes, wetlands, and tidal flats; increased flooding and storm damage in low-lying coastal areas, damage to costal infrastructure and property, etc.)(SF Dept. of the Environment 2004).

The San Francisco Bay Conservation and Development Commission (BCDC) has mapped the effects of such a sea-level rise in the San Francisco Bay Area, including a 16-inch rise by mid century and a 55-inch rise by the end of the century. According to BCDC maps and projections, this predicted rise in water levels may be less in the Project study area (BCDC 2008) due to the existing breakwater and the steeper slope rising up from the shore. Thus, such a rise is not expected to impact the proposed streetcar extension alternatives, as the alternatives would be at an adequate distance and elevation to be protected from such a rise. For this reason, the sea-level rise impact topic was dismissed from further evaluation in this report.

- **Wetlands:** E.O. 11990, Protection of Wetlands, directs federal agencies to avoid adverse impacts to wetlands. No potential jurisdictional waters of the United States are within the Project area. The San Francisco Bay, which is a jurisdictional water of the U.S., is located within the study area. No fill or adverse modification of wetlands or non-wetland waters of the U.S. by the Project are expected. Therefore, this topic was dismissed.

- **Wilderness Values:** The Wilderness Act of 1964 established the national wilderness preservation system. This impact topic was dismissed because there are no designated wilderness areas within the study area.

- **Wild and Scenic Rivers, Ecologically Critical Areas:** The Wild and Scenic Rivers Act of 1968 established the national wild and scenic river system to preserve certain rivers with outstanding cultural, natural, or recreational values. There are no designated wild, scenic, or recreational rivers or other designated ecologically critical areas within the study area; therefore this topic was dismissed.

- **Water Resources:** With the exception of the San Francisco Bay, which would not be impacted by the Project, no other surface waterways are present in the Study Area. As noted above, no fill or adverse modification of wetlands or non-wetland waters of the U.S. by the Project are expected. The Study Area is not subject to flooding of natural waterways. Neither of the Project alternatives would result in any change to water rights. If the Proposed Action were implemented, a National Pollutant Discharge Elimination System general permit—including a storm water pollution prevention plan—would be obtained prior to construction and would incorporate best management practices to reduce storm water pollution and erosion. Additionally, design and construction for facilities within the study area would comply with NPS and GGNRA policies, standards and guidelines, including the Golden Gate Project Handbook (NPS 2004a). Therefore, this topic was dismissed.

1.9 PROJECT PARTNERS

1.9.1 Cooperating Agencies

The core team for this Project includes the National Park Service as the lead federal agency for the DEIS, as well as representatives from the following cooperating agencies:

- San Francisco Municipal Transportation Agency
- Federal Transit Administration

1.9.2 Technical Advisory Committee

A TAC was convened to meet periodically to review the progress of the Project and provide technical support during the various stages of the study and preparation of the EIS. Members of the TAC include the cooperating agencies as well as representatives from the following organizations:

- Fort Mason Center
- Golden Gate National Parks Conservancy
- Market Street Railway
- San Francisco Department of Recreation and Parks
- San Francisco County Transportation Authority

1.10 PLANNING PROCESS

The EIS (Draft and Final) is being prepared in accordance with NEPA and *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making*. The Draft EIS describes, analyzes, and compares the potential environmental impacts of the alternatives and their implementation, and provides additional information on the methodologies and assumptions used for the analyses. It also proposes mitigation measures that can minimize the effect of adverse impacts. When the DEIS is published, agencies and the general public have the opportunity to review and comment on the document during a formal comment period, which is required to be a minimum of 60 days long. Public hearings are held during the comment period. The public comment period begins upon publication of a Notice of Availability (NOA) for the DEIS in the Federal Register.

Public comments are recorded and categorized in order for the National Park Service to prepare responses to the comments, which are then incorporated into the Final EIS (FEIS). The FEIS incorporates revisions to the text that correspond to the comments received and identifies the lead agency's reasons for selecting the preferred alternative. The release of the FEIS is announced by publishing an NOA in the Federal Register. Once the Final EIS is published, a minimum 30-day waiting period is required before a Record of Decision (ROD) can be issued. A ROD notifies the public of the alternative that the agency has selected to be carried forward for more detailed engineering and design and the rationale for that decision. The EIS analysis is considered as part of the decision-making process, which may also include consideration of other decision factors such as costs, technical feasibility, agency statutory mission, project purpose and need, and goals and objectives.

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Chapter 2
Alternatives

2.0 ALTERNATIVES

2.1 INTRODUCTION

This chapter identifies a range of alternatives that were considered technically feasible and that meet the project objectives, as outlined in Chapter 1. Purpose and Need. The following sections present the development and evaluation of the project alternatives and the selection of the preferred alternative.

2.1.1 Alternatives Development Process

The National Environmental Protection Act (NEPA) requires that an Environmental Impact Statement (EIS) evaluate a reasonable range of feasible alternatives to the proposed action. The EIS must evaluate a No Action Alternative to allow decision makers to compare the effects of approving the proposed action with the effects of not approving it. Alternatives must be evaluated in the same level of detail provided for the proposed action (40 Code of Federal Regulations [CFR] 1502.14).

The preliminary alternatives considered in this EIS were developed based on previous planning studies, public scoping and agency working group input. In 2004, the *Muni E-Line Extension Feasibility Study* (Feasibility Study) was conducted under the direction of a Project Steering Committee consisting of the Presidio Trust, the Golden Gate National Recreation Area (GGNRA), the San Francisco Maritime National Historical Park (NHP), Fort Mason Center (FMC), Market Street Railway, and San Francisco Municipal Transportation Agency (SFMTA). The Feasibility Study examined the technical feasibility of extending the SFMTA San Francisco Municipal Railway's (Muni's) proposed E-Line[1] west from its proposed initial terminal in Fisherman's Wharf to Fort Mason. A number of alternatives were considered and broken into sections or segments and sub-segments. The mode of transportation considered for all alternatives in the Feasibility Study was streetcar, and all alternatives used the Fort Mason Tunnel.

The alternatives proposed in the Feasibility Study were further developed and refined during the environmental review process for this project to generate alternatives for the Proposed Action that were responsive to public and agency comments, the Project Goals and Objectives, and the Purpose and Need. Particular attention was paid to minimize impacts to the parks and the historic districts. The rest of the preliminary alternatives considered but eliminated from further study are discussed in Section 2.5 of this chapter.

Public Scoping. The scoping process began March 29, 2006, and included a public scoping meeting and a local and regulatory agency scoping meeting, both held on May 9, 2006. Project objectives were refined from those in the Feasibility Study, and alignment alternatives, transition segments, and

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[1] As noted in Chapter 1, the E-line (also known as the E-Embarcadero Line) is identified in the SFMTA FY2008-FY2027 *Short Range Transit Plan* as a historic streetcar line that is proposed to run along the length of The Embarcadero using the existing F-line track between the Caltrain Terminal at Fourth and King Streets and the existing F-line terminus at Jones Street (Fisherman's Wharf). This project uses the term F-line extension since the E-line has not been developed. In the future, the extension proposed in this project from Fisherman's Wharf to Fort Mason Center may be a part of the E-line.

turnaround concepts were presented at both the public and agency scoping meetings. The following project objectives were presented:

- Increase alternative transportation options for visitors to the SF Maritime NHP and Fort Mason Center;
- Serve a defined recreation and cultural corridor along the northern waterfront;
- Enhance links for the City's transit-dependent population with all NPS sites and other northern waterfront attractions;
- Improve local and regional transit connectivity and decrease the need for automobile use and parking in historic and environmentally sensitive areas;
- Facilitate efforts to reduce the need for automobile-based trips to the National Historic Landmark District destinations by providing park visitors an attractive, non-polluting mass transit access;
- Avoid or minimize adverse effects on the National Historic Landmark District and related cultural and historic resources and waterfront values.

Alternatives Screening Process. Following the identification of alternatives, a screening process was developed to eliminate alternatives that were not feasible or that did not meet the project's purpose and need. Evaluation criteria were developed in consultation with the cooperating agencies and the Technical Advisory Committee[2] (TAC) to screen the alternatives developed in scoping to be taken forward into the environmental process for analysis, and to be compared against a No Action scenario. The screening criteria for this project were organized into three major areas:

- **Purpose and Need** – Criteria relating to the Purpose and Need for the project.
- **Park Preservation** – Criteria relating to the various objectives of the National Park Service in operating the national parks through which this project passes.
- **Operability** – Criteria relating to the technical capabilities and limitations of the transit vehicles and infrastructure proposed for use in the various alternatives, and criteria relating to the objectives of the SFMTA in operating the citywide transit system.

This section will describe the individual criteria developed for each screening subject area, and how it was applied in the process.

Purpose and Need Criteria

- **Increase connectivity with regional transit services** – The degree to which each alternative facilitates transit connectivity, which is the ability of users to connect from one transit system to another. For this project's purposes, it is desirable to provide visitors with the greatest number of possible regional transit connections, within one-half block of the proposed alignment, such as to the Caltrain Terminal, Ferry Building, Bay Area Rapid Transit (BART), Transbay Terminal.

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[2] The project's TAC consists of the NPS/GGNRA, NPS/San Francisco Maritime NHP, San Francisco Municipal Transportation Agency – San Francisco Municipal Railway (Muni), Federal Transit Administration, Fort Mason Center, Market Street Railway, San Francisco County Transportation Authority, and San Francisco Department of Recreation and Parks.

- **Improve connectivity for transit-dependent residents** – The degree to which each alternative enables transit-dependent residents to access the two national parks and the northeastern waterfront with one or no transfer.
- **Improve local transit access** – The degree to which each alternative provides enhanced local transit.
- **Connect the San Francisco Maritime NHP and GGNRA to trip generators[3] along the northeastern waterfront cultural and recreational corridor** – The degree to which each alternative connects NPS sites with trip-generating elements of the northeastern waterfront cultural and recreational corridor, such as the Ferry Building, the Alcatraz ferry dock at Pier 33, and the shops and aquarium at Pier 39.
- **Facilitate and encourage potential transit ridership increase** – The degree to which each alternative facilitates projected increased transit ridership to the two national parks.
- **Increase connectivity with current historic streetcar service** – The degree to which each alternative directly (no transfer) links to the existing historic streetcar service.
- **Integrate historic infrastructure** – The degree to which each alternative incorporates historic rail infrastructure, as identified in previous NPS plans.

Park Preservation Criteria

- **Minimize impact on National Historic Landmark (NHL) Properties** –The degree to which each alternative minimizes adverse effects on the Aquatic Park National Historic Landmark District (NHLD) and the San Francisco Port of Embarkation NHLD. There are several historic properties within the project study area. Any effects to these properties would be taken into account and avoided, minimized or mitigated.
- **Minimize impact on the existing historic and cultural setting** – The degree to which each alternative minimizes visual, noise, or other impacts on historic and cultural facilities.
- **Minimize use of parkland for non-park purposes** – The degree to which each alternative minimizes the use of parkland for a non-park use (e.g., incorporation into a transportation facility, temporary occupancy of park land that would result in permanent adverse physical impacts, or would interfere with the activities or purpose of the park).
- **Increase access to NPS facilities** – The degree to which each alternative is in close proximity to NPS sites, without physical impediments to access (e.g., steep grades, physical barriers) between the proposed project area and NPS facilities.
- **Minimize bike and pedestrian impacts** – The degree to which each alternative minimizes conflict with major bike or pedestrian flows.
- **Minimize air quality impacts** – The degree to which each alternative minimizes air quality impacts through incorporation of vehicles and other operating facilities that produce the least possible emissions.

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[3] Trip generators are activity centers, sites, or amenities that attract people, whether they are local residents or out-of-town visitors.

Operability Criteria

- **Engineering – street grade** – The degree to which each alternative minimizes operation on steep grades. Grades between 6 and 9 percent are not desirable for rail operations. Grades between 3 and 6 percent are not optimal, but acceptable. Grades less than 3 percent are the most desirable.
- **Engineering – curves and special work** – The degree to which each alternative minimizes construction and operation of complex trackwork—especially in combination with curves and/or steep grades—for operational safety, maintainability, and transit rider comfort. Complex track work, special work on steep grades, and curves on steep grades are not desirable.
- **Maximize separate right-of-way for transit** – Measurement of mileage operating in a separate off-street right-of-way (ROW) (e.g., in tunnel, open space).
- **Arterial traffic** – The degree to which each alternative maximizes the ability to create reserved or semi-exclusive ROW within street for separation from arterial traffic.
- **Minimize operating costs** – The degree to which each alternative minimizes estimated incremental additional operating cost for each alternative.
- **Service design** – The degree to which each alternative adheres to Muni Service Planning guidelines - conforms with overall route network structure and conforms to general Muni preferences for straight-line routes, minimizes use of single-purpose shuttles, and maintains the ability to serve both directions of travel at the same location.
- **Network Efficiency** – The degree to which each alternative minimizes the amount of time spent traveling out-of-direction.
- **Minimize conflict with other transit operations** – degree to which each alternative minimizes conflicts with other transit modes, operations and terminals and minimizes the necessity to move other transit operations to accommodate the project.
- **Surface operational safety** – The degree to which each alternative ensures that the surface operational safety for all users, operators, and the public is not compromised by any operating condition, or combination of conditions.
- **Tunnel Operational Safety** – The degree to which each alternative provides a secure method for controlling operation in the Fort Mason tunnel by precluding non-transit vehicle access into the tunnel.

Results of Preliminary Alternatives Evaluation. The results of the preliminary alternatives evaluation yielded one alignment alternative and two turnaround options. Two design options were added for the on-street segments; these design options are essentially different arrangements of the trackway within the street ROW. Together these alternatives fully address the project objectives and project purpose and need while also avoiding or minimizing impacts to nearby resources. Among all the preliminary alternatives considered technically feasible, they are considered the only reasonable alternatives to be considered for detailed analysis in this EIS. Based upon the conceptual engineering analysis, these alternatives are considered technically feasible and cost effective. These alternatives were, therefore, selected for further analysis regarding their potential environmental impacts and are carried forward for analysis. Section 2.5 describes the rest of the alternatives that were considered dismissed from further analysis.

2.2 ALTERNATIVES ANALYZED IN DETAIL

This section describes the alternatives considered for detailed analysis.

2.2.1 Project Study Area Segments

The Project study area includes a 0.85-mile length from the established F-line terminus on Jones Street at Fisherman's Wharf through San Francisco Maritime NHP, extending west through the historic State Belt Railroad tunnel (Fort Mason Tunnel) to a new terminus in GGNRA in either Fort Mason Center or Great Meadow (see Figure 1-2).

The study area is divided into the following four segments analyzed separately in the alternatives: In-Street; Transition; Fort Mason Tunnel; and Turnaround (**Figure 2-1**). During the alternatives development process alternatives were examined for each of these segments as described in Section 2.5.

In-Street Segment. This approximately 2,500 foot street running segment runs along Beach Street between Jones Street and the base of Polk Street (approximately adjacent to the Maritime Museum). This segment would connect the terminus of the existing F-line at Jones Street with the proposed F-line extension.

Transition Segment. This approximately 750 foot segment connects the In-Street Segment from Beach Street, through San Francisco Maritime NHP, and up to the Fort Mason Tunnel Segment. This segment crosses Van Ness Avenue before entering the tunnel.

Fort Mason Tunnel Segment. The existing 1,500 foot tunnel segment runs underneath Fort Mason and the Great Meadow from the east tunnel portal at Van Ness Avenue to the west tunnel portal at Marina Boulevard and Laguna Street. It is a single-track tunnel, used for freight train movements until the late 1970s. This tunnel segment would need to accommodate the bi-directional movement of streetcars on a single track. Structural rehabilitation of the tunnel would be required for its use.

Turnaround Segment. The turnaround segment occurs between the west tunnel portal at Marina Boulevard and Laguna Street. The areas considered in the alternatives include the lower Fort Mason (Fort Mason Center) parking lot and the Great Meadow. The turnaround segment would be the terminus of the proposed F-line extension and would allow for westbound streetcars to turnaround in a loop of track before returning eastbound back through the Fort Mason Tunnel.

2.2.2 Alternative 1 – No Action

The No Action Alternative is included as an alternative for detailed analysis pursuant to 40 CFR 1502.14(d) of the Council on Environmental Quality regulations. The No Action Alternative assumes that the National Park Service would not grant a new easement for a streetcar extension. The existing F-line Streetcar service, which terminates at Jones Street, would not be extended. There would be no construction or transit operation costs, and no additional funding would be raised. Chapter 3.4,

Transportation and Circulation, describes the current transit services and storage and maintenance facilities in the study area.

Alternative 1 provides a baseline for comparing the other alternative, evaluating the magnitude of proposed changes, and measuring the effects of those changes. The No Action alternative follows the guidance of the Council on Environmental Quality, which describes the No Action alternative as representing no change from the current management direction. Under the No Action Alternative, the F-line would not be extended beyond Fisherman's Wharf; the Transition Segment within the Aquatic Park NHLD would remain undisturbed; the Fort Mason Tunnel would remain closed and would not be renovated or made seismically sound; and the Turnaround Areas (Great Meadow or lower Fort Mason) within the Fort Mason National Register Historic District and the San Francisco Port of Embarkation NHLD (see Figure 2-1) would remain undisturbed.

The 2007 *Fort Mason Center Employee Survey* (URS 2009f) concluded that approximately 17 percent of Fort Mason Center employees currently arrive at work by transit. The 2007 *Fort Mason Intercept Survey* (URS 2009f), which surveyed 729 visitors to Fort Mason Center found that approximately 11-14 percent of current visitors reported that they took transit to Fort Mason.

The lack of connectivity between the Fort Mason Center and nearby transit lines is depicted on Figure 1-2. The 28 bus line provides the closest connection to Fort Mason Center with a station at Marina Boulevard and Laguna Street; however this bus line originates in Daly City and only services the western and northern parts of San Francisco.[4] Passengers arriving near Upper Fort Mason via the 47 or 49 bus lines, disembark at Van Ness Avenue and North Point Street and then walk approximately 0.6 miles along streets or a path through the Great Meadow to reach Fort Mason Center. Passengers arriving via the 30 would disembark at Chestnut Street and Laguna Street and then walk approximately 0.3 miles along Laguna Street to the Fort Mason Center entrance. Visitors coming from Fisherman's Wharf take the existing F-line to Jones Street and then walk approximately 1 mile to reach the Fort Mason Center.

2.2.3 Alternative 2 – Proposed Action Alternative (with Turnaround Options)

The Proposed Action would extend the existing F-line streetcar service from Jones Street to Fort Mason Center. This section describes the Proposed Action components, as well as anticipated construction requirements and operation. Section 2.5 provides detail regarding the alternative development process which resulted in the Action Alternative. Alterative 2 includes a preferred In-Street alignment, Transition, Fort Mason Tunnel, and Turnaround Segments. The Turnaround Segment presents two options, Alternative 2A: North Loop (located in the Fort Mason Center parking lot) and Alternative 2B: South Loop (located in Great Meadow), which are analyzed separately in the Environmental Consequences chapter. The segment details are summarized in **Table 2-1**. The In-Street Segment presents both mixed traffic and semi-exclusive options (autos do or do not share

[4] SFMTA's *Transit Effectiveness Project* recommends changes to the 28 and 28L bus line that would eliminate the bus stop closest to Fort Mason Center at Marina Boulevard. The new route would run along Lombard Street and terminate at Van Ness Avenue and North Point Street (SFMTA 2008b).

Note: Track details generalized.

ALTERNATIVE 2 PROJECT COMPONENTS AND TRACK SEGMENTS

Draft Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 2-1

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Table 2-1: Alternative 2 Project Segment Details

	In-Street Segment	Transition Segment	Fort Mason Tunnel Segment	Turnaround Segment Option–Alternative 2A North Loop (Preferred)	Turnaround Segment Option–Alternative 2B South Loop
Description	Operates in both directions on Beach Street between Leavenworth Street and the transition at Van Ness Avenue. • semi-exclusive operations along Jefferson Street • mixed traffic operation along Leavenworth Street • crossing the existing cable car tracks at Hyde Street	The transition segment takes the alignment from the double-track, street-running segment to the east, shifting the alignment to NPS property to the west of Polk Street. The line would move from double track to single track between the platforms and the tunnel portal.	The streetcar extension would run on a single track through the tunnel. Tunnel improvements would include installation of new track and overhead lines and reconstruction of the tunnel interior	In the North Loop turnaround tracks would loop north out of the Fort Mason Tunnel and enter the Lower Fort Mason parking lot.	In the South Loop turnaround tracks would loop south out of the Fort Mason Tunnel and enter the Great Meadow.
Segment-Specific Details	Options to be determined during design phase: 1) shared auto/streetcar operation 2) semi-exclusive for the eastbound alignment and shared operation for the westbound alignment 3) hybrid of the two options	None	Upgrades needed: Installation of new track and overhead lines and reconstruction of the tunnel interior—including a new tunnel lining, ventilation fan, signals, lighting, and utilities and traction power feeders. Additional capacity (e.g., track circuitry and logic controlling the signaling and the interlocking) would also be built into the system		
Station Platforms	Total Added: Four Location: • dual side platforms on bulbed-out sidewalks west of Hyde Street on Beach Street • eastbound side platform west of Jones Street on Beach Street • westbound side platform south of Jefferson Street on Leavenworth Street	Total Added: Two Location: • east side of the transition segment • west side (located just south of an existing east/west pedestrian path and the historic speaker tower in Aquatic Park)	Total Added: None	Total Added: Two Location: • alongside Building A • on the loop's eastern side near the east retaining wall in the Fort Mason Center parking lot	Total Added: One Location: • In the Great Meadow adjacent and parallel to Laguna Street
Specifications Common to all Segments	signals, crossings, wires and poles	signals, crossings, wires and poles	signals	signals, crossings, wires and poles	signals, crossings, wires and poles

track right-of-way); however these would be determined during the final design phase. They have been analyzed separately as appropriate in the resource sections.

Project Components. If implemented, the extension would include approximately 0.85 mile of new rail track; associated features such as signals, crossings, wires and poles; approximately 8-9 new platforms; new designated stops; retrofitting of the historic State Belt Railroad tunnel (Fort Mason Tunnel); and construction of a track turnaround in the Fort Mason Center parking lot or Great Meadow.

In-Street Segment. The configuration options for the In-Street alignment, between Polk Street and the existing streetcar terminal at Jones Street, were developed based on what was termed Alignment Option 3: Beach Street, in the Feasibility Study. This alignment operates in both directions on Beach Street between Leavenworth Street and the transition at Van Ness Avenue (see **Figure 2-2**). One option consists primarily of shared auto/streetcar operation and a second option consists of semi-exclusive for the eastbound alignment and shared operation for the westbound alignment. There are portions of the shared option that contain semi-exclusive operations along Jefferson. It is possible to create a hybrid of the two options having some semi-exclusive and some shared for the eastbound alignment. As described above, these options would be determined during the final design phase. Due to the high level of pedestrian activity in this area, special attention will be paid to pedestrian safety measures during the final design. The curved cable car trackage through the intersection at Beach Street and Hyde Street will require a custom, fabricated crossing to accommodate the cable car appurtenances and maintain traction power (URS 2009e). The actual design of the cable car crossing structure will be accomplished during preliminary and final design. Both options include:

- semi-exclusive operations along Jefferson Street
- mixed traffic operation along Leavenworth Street
- crossing the existing cable car tracks at Hyde Street
- three new traffic signals and three existing signals would be added or reconstructed to accommodate streetcar operations
- Mini-high station platforms that are Americans with Disabilities Act (ADA) compliant:
  - Dual side platforms on bulbed-out sidewalks west of Hyde Street on Beach Street
  - Eastbound side platform west of Jones Street on Beach Street
  - Westbound side platform south of Jefferson Street on Leavenworth Street

Mixed Traffic (autos share track lanes) Streetcar Design Option. Under this option, the alignment would extend from the transition segment at Beach Street and Polk Street and continue east along Beach Street to Leavenworth Street in mixed traffic. At Leavenworth Street, the eastbound alignment would continue on a single track along Beach Street to Jones Street where it would connect with the existing F-line streetcar tracks. The westbound alignment would proceed north on Leavenworth Street from Beach Street to Jefferson Street in mixed traffic for this block. At Jefferson Street, the westbound alignment would continue in semi-exclusive ROW east to Jones Street, where it would connect with the existing F-line. The existing F-line would be realigned with the proposed extension on a shared single track, through a semi-exclusive track configuration.

Source: Wilbur Smith Associates, 2004; NPS

LEGEND

- F Market (existing)
- Fort Mason Extension (proposed)
- Platform (existing)
- Platform (proposed)

ALTERNATIVE 2 PROPOSED ACTION ALIGNMENT

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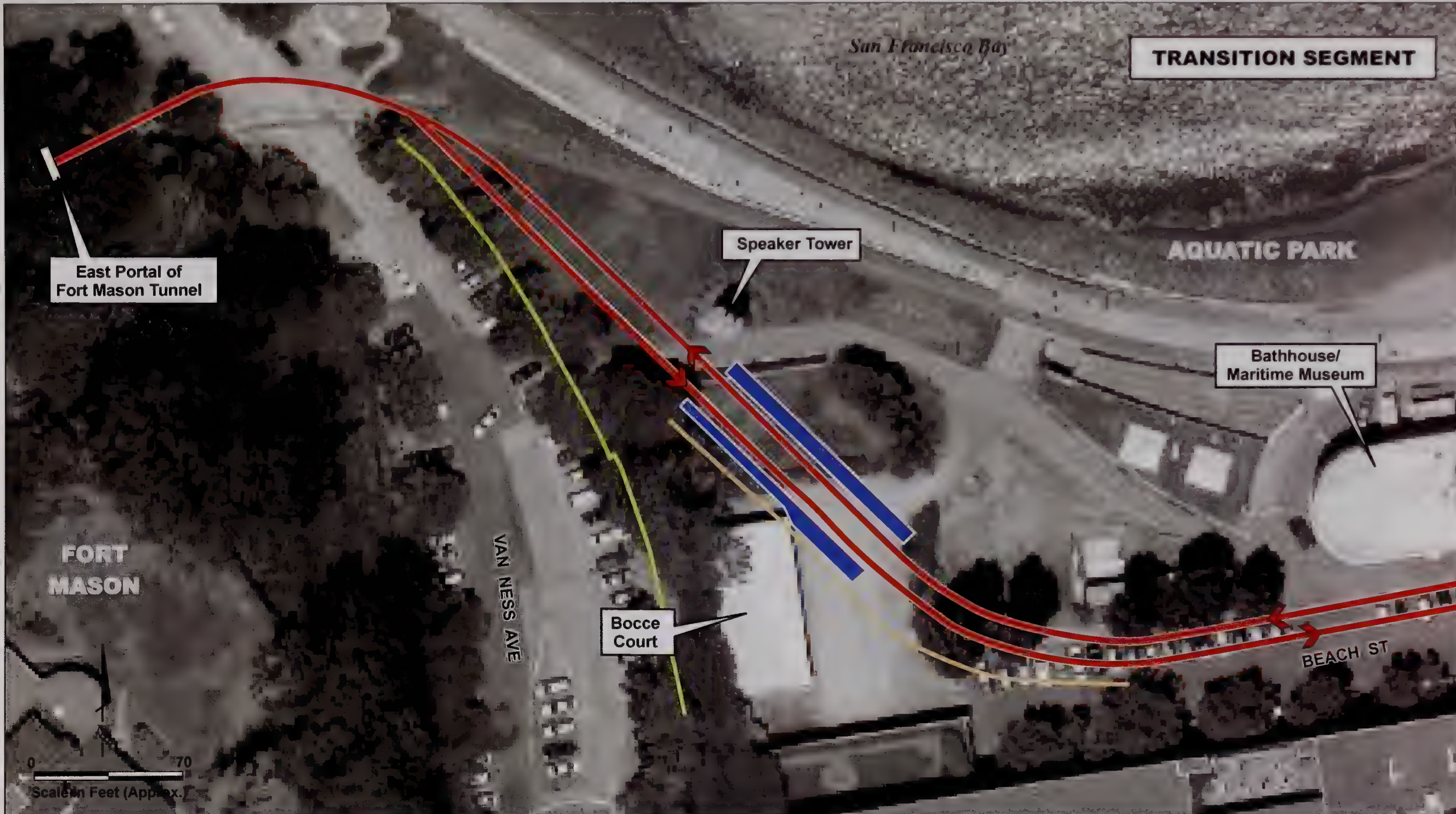
FIGURE 2-2

Semi-exclusive Eastbound Option. Under this scenario, the eastbound alignment would extend from the transition segment at Beach Street and Polk Street east along Beach Street to Leavenworth Street with the eastbound streetcar in a semi-exclusive ROW (autos do not share track lanes, except when making turns) and the westbound streetcar in mixed traffic. At Leavenworth Street, the eastbound alignment would continue in a semi-exclusive ROW along Beach Street to Jones Street, where it would connect with the existing F-line streetcar tracks. The westbound alignment would be configured in mixed traffic north on Leavenworth Street to Jefferson Street. At Jefferson Street, the westbound alignment would continue in a semi-exclusive ROW east to Jones Street, where it would connect with the existing F-line streetcar tracks. The proposed Fort Mason extension would continue adjacent to the existing F-line for approximately one-half block east of Jones Street, where the two alignments would connect. The eastbound streetcar alignment would be semi-exclusive for the entire segment. The westbound streetcar alignment would be shared with autos except along Jefferson Street, where it would be configured as semi-exclusive ROW.

Transition Segment. The In-Street segment requires traversing NPS property between approximately Beach and Polk Streets and the tunnel's eastern portal at Van Ness Avenue, in an area known as the "transition." The transition segment takes the alignment from the double-track, street-running segment to the east, shifting the alignment to NPS property to the west of Polk Street. Due to the high level of pedestrian activity in this area, special attention will be paid to pedestrian safety measures during the final design. A station would be located on the transition segment near the base of Van Ness Avenue, and the line would move from double track to single track between the platforms and the tunnel portal. **Figure 2-3** illustrates this area. Passengers wishing to transfer from the existing bus terminal at Van Ness Avenue and North Point Street (see Figure 1-2) to the F-line extension will walk north on Van Ness Avenue and take a right at the first trail and walk to the station platform. The station would have two mini-high, ADA-compliant platforms, one installed on the east side of the transition segment, and one on the west side (located just south of an existing east/west pedestrian path and the historic speaker tower in Aquatic Park).

The transition segment area was developed through consultation with the project's TAC and other stakeholders. It combines earlier versions of two design segments, segments #E-3A(1) and #E-3A(2), that were dismissed (see Section 2.5). Other changes in the transition area would include adding retaining walls, modifying existing historic retaining walls, and possibly modifying or relocating the Aquatic Park Bocce Ball Court. The General Management Plan to be prepared by the San Francisco Maritime NHP would provide direction on future use of the bocce ball court area within the transition area, including retaining the bocce ball court or using the area for a maintenance facility. If the outcome of the GMP or the final design of the transition area is to move the bocce courts, then impacts to this recreational activity would be minimized by relocating the courts before construction of the proposed streetcar line through the transition area. If the bocce court is to be relocated, then the National Park Service would conduct a separate planning effort to evaluate suitable bocce court sites within and outside the parks.

Fort Mason Tunnel Segment. The Fort Mason Tunnel is a concrete-lined tunnel that was constructed in 1914, and was operated by the State Belt Railroad for active freight service until the late 1970s. The tunnel is currently owned by the National Park Service. It runs east-west about 60 feet beneath the upper Fort Mason complex. The tunnel is about 1,500 feet long, 16 feet wide and 22 feet



Source: NPS; Google Earth 2009.

ALTERNATIVE 2 PROPOSED ACTION TRANSITION SEGMENT AREA

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Historic Streetcar Extension
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FIGURE 2-3

LEGEND

- Proposed Streetcar Alignment
- Platform
- Existing Retaining Wall
- Proposed Retaining Wall

high at its highest point. Given these limitations, the proposed streetcar extension would run on a single track through the tunnel. The design and configuration of track within the Fort Mason Tunnel would be based on the *Tunnel Rehabilitation and Preliminary Cost Estimate Report* (Jacobs 2005). The tunnel improvements would include installation of new track and overhead lines and reconstruction of the tunnel interior—including construction of a new tunnel lining. Associated ventilation fan, signals, lighting, and utilities would be installed, including traction power feeders. Additional capacity (e.g., track circuitry and logic controlling the signaling and the interlocking) would need to be built into the system to control the number of cars allowed west of the tunnel's eastern portal, in order to ensure that more cars did not proceed west through the tunnel than could be handled by the Fort Mason terminal. There are currently manual tunnel gates providing tunnel security. Future tunnel security under the Project may replace the manual security gates with automatic security gates close to the tunnel entrance (Pulon 2010).

Turnaround Segment Options.

Alternative 2A: North Loop (Preferred). The North Loop turnaround (originally called Option 3) would consist of tracks that loop north out of the west portal of the Fort Mason Tunnel and enter the Fort Mason Center parking lot (see **Figure 2-4**). A 155-foot-long by 13-foot-wide, ADA-compliant mini-high station platform would be constructed alongside Building A. A second platform could be placed on the loop's eastern side, near the existing east retaining wall. A storage track would be provided extending west from the loop, adjacent to the NPS gate house. A detection circuit with a "clear to proceed" signal would be installed at the south end of the platform or adjacent to the Fort Mason Tunnel. The Project would be designed to ensure the safety of pedestrians and bicycles including measures such as incorporating traffic signals where appropriate.

Alternative 2B: South Loop. The South Loop option would consist of tracks that loop south after it emerges from the west portal of the Fort Mason Tunnel in the Great Meadow. One 155-foot-long by 13-foot-wide, ADA-compliant mini-high station platform would be located adjacent and parallel to Laguna Street. Space for vehicle storage would be on a stub track inside the terminal loop. This configuration is shown in **Figure 2-5**.

Other Project Components. In order to connect the in-street alignment, turnarounds, and transition segments discussed above, the following ancillary components would be required: traction power system, overhead contact system, signaling.

Traction Power System. The streetcars would be powered by a traction power system which would feed power to the overhead contact system (OCS), described below. The traction power system would connect to an existing substation[5] (shown on Figure 1-2) via underground feeders in duct banks and would provide power to the OCS.

Overhead Contact System. The OCS would consist of a single-wire system similar to the existing Muni OCS on the F-line tracks in the Fisherman's Wharf area. The OCS would be configured for trolley pole operation by historic streetcars. The OCS would also be configured to accommodate pantograph operation consistent with the configuration of the existing F-line segments in the Fisherman's Wharf

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[5] The closest Muni substation is Marina Station, located at 1575 North Point Street.

Source:Transit Operations Plan, URS, July 2009

LEGEND

Parking will be removed in this area for operational and pedestrian safety

ALTERNATIVE 2 PROPOSED ACTION NORTH LOOP TURNAROUND

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FIGURE 2-4

Source:Transit Operations Plan, NPS

ALTERNATIVE 2 PROPOSED ACTION SOUTH LOOP TURNAROUND

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FIGURE 2-5

area and along the Embarcadero roadway. This would extend the existing OCS capabilities for pole and pantograph operation that currently exist along the northeast waterfront from Fisherman's Wharf to the Muni Metro terminal near the Caltrain Terminal. The poles would be spaced every 100 feet on tangent track, and closer together where the track curves.

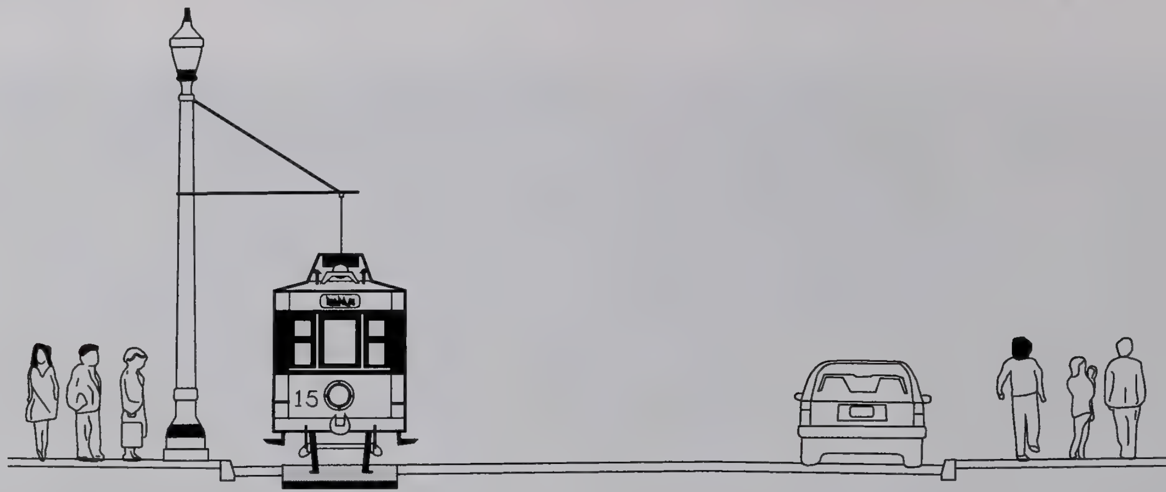
There are three OCS configurations that the proposed action would utilize. The first configuration would be a span of wire hanging between two poles. This configuration would be used on streets with double tracks. The second configuration would be utilized on streets with only one track; the OCS would be suspended from a mast arm attached to a trolley pole on the sidewalk, incorporating decorative streetlights similar to those used for the F-line. The third configuration would suspend the OCS from center poles with two mast arms, suspending out over both tracks. **Figure 2-6** illustrates the three types of OCS suspension. Track junctions, 90-degree corners and terminal trackage would require more specialized OCS suspension. The OCS suspension configurations for the Proposed Action would be determined during the design phase.

Signaling. In the street-running segments of the Project, streetcar movements would be governed by line-of-sight operations, with movement at intersections controlled by traffic signals. Traffic signals or stop signs will be used at intersections. At these intersections a separate signal head may be provided for streetcar control. The streetcar control signal would be interconnected to the traffic signals and provide the streetcar operator an indication of when the streetcar is clear to move or required to stop. In areas of exclusive ROW, where streetcars operate on a dedicated trackway, vehicle operations would be governed by an Automatic Block Signaling (ABS) system. The ABS area would be marked with wayside signs, sized per SFMTA regulations.

2.2.4 Construction

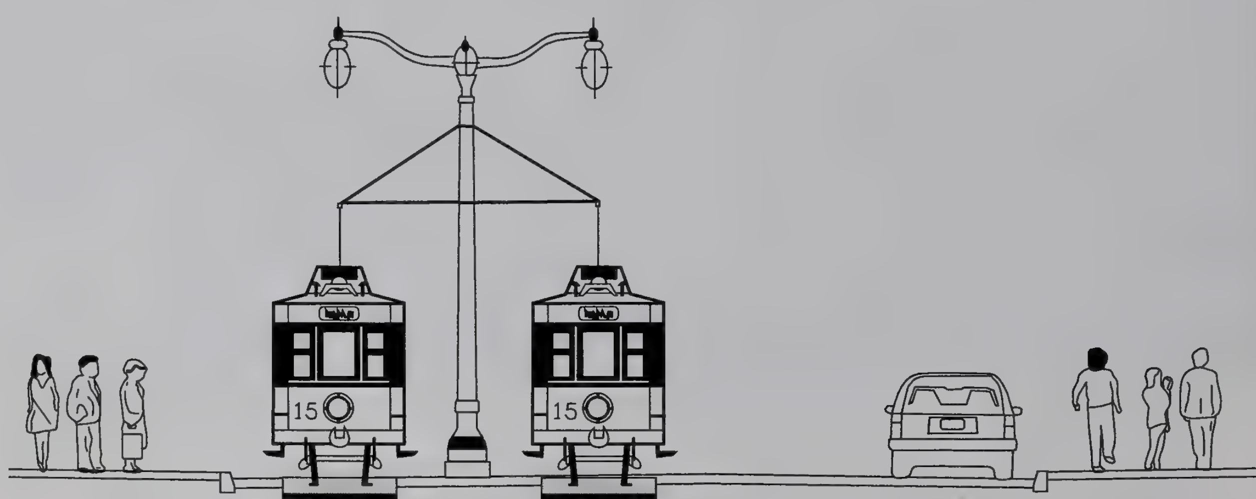
The construction activities for the Proposed Action would affect portions of Jefferson Street, Leavenworth Street and Beach Street (street sections), Van Ness Avenue and the transition area between the intersection of Beach Street and Polk Street and the Fort Mason Tunnel (transition section), the Fort Mason Tunnel (tunnel section) and the turnaround area at Lower Fort Mason or the Great Meadow. Construction activities would include multiple contractor laydown areas, which would range in size, from 500 to over 5,000 square feet.

Schedule. Construction would be expected to occur from 18-24 months, with SFMTA overseeing construction pending resource availability. Construction would be phased to retain some access to each street at all times. Traffic may be re-routed temporarily and loading/unloading of delivery trucks and parking may be relocated. Construction would only occur on one side of the road at a time. Construction of tracks and rail along each block segment is anticipated to be 3 weeks on each side of the road, for a total of 6 weeks per block; this is in addition to advance utility work (anticipated to be 4 weeks/side/block [total of 8 weeks per block]), and subsequent installation of poles and other ancillary features (minor work that would not be anticipated to disrupt vehicular or pedestrian traffic, access, etc.). Actual timing may vary depending on the number of crews that the contractor builds into their schedule or the types of restrictions (i.e., no night work) placed on the contractor by the city.



1. Suspended from two mast arms

2. Suspended from span wire between two poles



3. Double tracks suspended from center-pole mast

STREET CROSS-SECTIONS TYPICAL OCS SUSPENSION

Draft Environmental Impact Statement
Historic Streetcar Extension EIS
San Francisco, California

FIGURE 2-6

In-Street Segment. The construction activities on the in-street alignment portion of the Proposed Action would affect the streets and blocks shown on Figure 2-1. Construction would include installation of embedded trackway within the street ROW, requiring excavation to a depth of 3 feet. The street would be reconstructed curb-to-curb in all locations, and property line-to-property line in selected locations. Utilities would be updated and/or relocated within the street ROW on all blocks. The utility excavation depth would typically be 5 feet.

Trolley poles, overhead wires for the OCS, and an underground traction power feeder system would be installed. The sidewalks at station platform locations would be extended via bulb-outs into the parking lane. Station platform construction would include construction of 34-inch tall mini-high level ramps to meet ADA access requirements. The construction activities would be phased to retain some access to each street block at all times. Traffic may be re-routed temporarily and loading/unloading of delivery trucks and parking may be relocated.

Cable Car Crossing. Construction of the crossing of the cable car line at Hyde Street would require careful coordination and advance work to prepare the underground cable car machinery vaults in advance of streetcar track construction. It would also require phased closures of portions of the roadway and intersection of Hyde and Beach Streets for the preparation work and the installation. Underground excavation in this area would be monitored for the existence of a reported archeological site at the Hyde/Beach Street intersection. If archeological materials are found, this could extend the period of preparation work, installation of the streetcar line, or both. Work would require the closure of the 60 (Powell/Hyde) cable car line for up to one month. However, the length of closure time could be minimized if track work could be constructed in advance before it is installed. Because this would require the shut down of one cable car line, 50 percent more cable cars would be run on the 59 (Powell/Mason) line to accommodate ridership demand. For those who use the line for commuter or other purposes, a bus substitution (diesel bus) would run the full 60 (Powell/Hyde) line (Market Street to Hyde Street) during the cable car line closure. Actual installation of the crossing is estimated to take no more than one week following the advance preparation work. It is anticipated that the closure would occur during non-holiday, non-tourist peak season.

New switches to the F-line at Jones Street would be installed, which would take approximately six months and would likely require a temporary shuttle bus for the F-line for the duration of construction.

Traffic signals would be installed at the intersections of Jefferson and Leavenworth Streets, Leavenworth and Beach Streets, and Beach and Polk Streets. As much as possible, traffic lights would be coordinated with other signals adjacent to the project area. Traffic lanes on all affected streets would be re-striped.

Transition Segment. The transition section is the portion of the alignment from the intersection of Beach Street and Polk Street to the Fort Mason Tunnel (east tunnel portal) crossing the northern end of Van Ness Avenue (see Figure 2-3). During construction, it is anticipated that temporary closures of portions of Van Ness Avenue would be required.

Streetcar tracks would be constructed in open trackway configuration along with the traction power system and OCS. Two new station platforms with connecting sidewalks would be installed as well. A portion of the Bay Trail at Van Ness Avenue may be regraded. The existing bocce court, which is

currently located near the intersection of Van Ness Avenue and Beach Street, would be retained or relocated to be determined by a subsequent planning study.

A critical utility in this area is the auxiliary water supply system 20-inch line which is in the streetbed of Van Ness Avenue. The auxiliary water supply system line would be cased for protection during the construction of the streetcar tracks as well as during operation. Construction in the immediate transition area may require relocating and/or settlement monitoring of other utilities (as determined by the City and County of San Francisco Bureau of Engineering). Additionally, a portion of a historic granite retaining wall would need to be removed and salvaged.

Fort Mason Tunnel Segment. The construction activities for the Fort Mason Tunnel would include geotechnical investigation of the tunnel, track construction, reconstruction of the interior of the tunnel, including the construction of a new tunnel lining and injection of grout and epoxy materials into existing walls. Existing freight rail tracks currently in the tunnel would be removed and a single streetcar track would be constructed on the tunnel floor, which may require regrading of the tunnel floor. Overhead lines would be constructed and hung from the interior of the tunnel. Signals, switches, ventilation systems and other essential utility systems would be installed inside the tunnel. Construction would take approximately 9 to 12 months.

Turnaround Segment.

Alternative 2A: North Loop Option. For the North Loop Option, streetcar tracks would be constructed at grade. Portions of the existing historic track would be removed to accommodate new track construction. The construction of the station platform (Fort Mason Center terminal) would be performed in phases to minimize impacts including general public access to Fort Mason Center. Trolley poles, overhead wires for the OCS, and an underground traction power feeder system would be installed at the terminal. Portions of the existing retaining walls may be demolished and braces would be constructed as needed to reinforce the remaining retaining walls. Station platforms would be constructed at the terminal including a mini-high ramp that is ADA compliant and an operator restroom structure would be built.

Alternative 2B: South Loop Option. For the South Loop Option, the hillside to the south of the alignment would be regraded. Streetcar tracks would be constructed at grade with open track configuration. Potential tree removal would be required in the meadow area south of the historic State Belt Railroad alignment along with realignment of the pedestrian path. Trolley poles, overhead wires for the OCS, and an underground traction power feeder system would be installed at the terminal. Portions of the existing retaining walls would be demolished and braces would be constructed as needed to reinforce the remaining retaining walls. Both the north and south retaining walls along the alignment would also be removed, and the area south of the south wall excavated and re-graded; a new retaining wall would be constructed. Depending on final design configuration, the north retaining wall could remain in place. A station platform would be constructed at the terminal including a mini-high ramp that is ADA compliant. In addition, an operator restroom structure would be built. During construction there may be partial lane closures on Laguna Street.

2.2.5 Operation

The F-line extension would be in operation 7 days a week, from approximately 6:00 a.m. to 1:00 a.m. (the same hours as the existing F-line). The run time from the San Francisco Ferry Building to Fort Mason Center (as proposed) would be 23-27 minutes (URS 2009f). At peak hours of demand, the existing F-line operates at six minute headways[6]; therefore, the Proposed Action assumes a six-minute-headway for the F-line operational frequency—except as noted below. Weekday headways would be between 6–15 minutes, weekend headways would be between 8–15 minutes, as shown in **Table 2-2.** Use of the Fort Mason tunnel would limit operations through the structure to headways of five minutes or greater. Therefore, to assess the greatest potential impact to properties within Fort Mason and the San Francisco Maritime NHP, the peak-period headway would be assumed to be 5 minutes for purposes of analyzing impacts. The operating speed of the F-line varies over its full length, with speeds on different segments ranging between 3.2 and 12.2 mph (exclusive of layover time) depending on the time of day and direction. The F-line extension would be designed with measures to ensure that the current 8 mph average operating speed would not be diminished. SFMTA recommends using transit signal priority and other measures to reduce delay and bring average speeds up to 10 mph.

TABLE 2-2: 2030 HEADWAYS FOR PROPOSED ACTION (JONES ST. TO FORT MASON)[a]

Weekday			
5:30 am – 9:00 am	9:00 am – 4:00 pm	4:00 pm – 6:00 pm	6:00 pm – 1:30 am
6 minutes	8 minutes	7 minutes	15 minutes
Weekend			
5:30 am – 10:00 am	10:00 am – 6:00 pm		6:00 pm – 1:30 am
10 minutes	8 minutes		15 minutes

[a] Start time (5:30 am) is the time the first eastbound car arrives at Jones Street, end time (1:30 am) is the time the last eastbound car arrives at Jones Street. Therefore, cars may be in operation within the project area before and after noted times. Times are approximate.

Single-Track Operations in Fort Mason Tunnel. The Fort Mason Tunnel is only wide enough to accommodate a single track. This places limitations on the proposed streetcar operations through the tunnel, including constraints on running times and headways as described above. Only one streetcar would occupy the tunnel at a time and operations would proceed with a westbound car first, followed by an eastbound car, followed by a westbound car, etc., in rotation. The running time for the single track section is estimated at approximately 2 minutes and 4 seconds assuming a travel speed inside of 15 mph inside the tunnel and 3.5 miles per hour for the surface approach.

Signals placed at the Transition area east platform and at the Turnaround tracks at the west portal of the Fort Mason Tunnel will act as an interlocking for the single track segment. Track circuitry will control the number of streetcars allowed west of the east portal to ensure that more streetcars do not reach Fort Mason than can be accommodated by the terminal trackage there. Proven and effective

[6] The time interval or distance between two vehicles, as railroad or subway cars, traveling in the same direction over the same route.

safety control mechanisms will be required for proactive implementation to prevent two rail vehicles from simultaneously occupying the single track section, even in the event of a signal violation.

Ridership. During fiscal year 2010 the average weekday ridership reported for the existing F-line was 20,921. The predicted ridership for the F-line with the extension would be 22,561 for average weekday ridership in 2030 (URS 2009f).

Vehicle Requirements. The F-line's current peak vehicle demand for service during the weekday is 26 vehicles (i.e., 18 scheduled revenue-service vehicles, two supplemental revenue-service shuttle cars, and six maintenance spare vehicles). The estimated 2030 weekday peak vehicle demand for the F-line with the extension to Fort Mason Center would require a total of 28 vehicles (i.e., 21 revenue-service vehicles and seven maintenance spare vehicles) (URS 2009f). The 2030 vehicle requirement assumes service provided by the current shuttle cars (from the Ferry Building to Fisherman's Wharf during some periods of high ridership) would be replaced by an E-line service. Therefore, assuming no E-line service, the Project would result in an increase in three revenue-service vehicles plus one maintenance vehicle for a total of four vehicles required for the extension of the F-line to Fort Mason Center.

The SFMTA service fleet consists of 17 President's Conference Committee (PCC) streetcars and 10 Peter Witt streetcars from Milan, Italy for a total of 27 cars. SFMTA is undertaking projects to increase the size of the regular service fleet. Eleven additional PCC cars were purchased from New Jersey Transit and are undergoing rehabilitation. In addition, four double-ended PCC cars are also undergoing rehabilitation. Once these cars are fully operational in the fleet, the regular service fleet would consist of 42 cars, which should be sufficient to cover the peak demand, plus spare cars (URS 2009f).

There are two streetcar maintenance facilities. Geneva Yard is SFMTA's primary facility for the repair and storage of the historic streetcar fleet located at San Jose and Geneva Avenues in San Francisco. It is anticipated that additional space would be available in the Geneva Yard when some of the light rail vehicles (LRVs) are moved from the Geneva Yard to the Metro East facility, therefore no related costs are anticipated for this project for maintenance facilities. The Duboce Yard is a satellite facility for historic streetcar rehabilitation and maintenance, located at Market Street and Duboce Avenue (URS 2009f).

The vehicles that would operate on the Historic Streetcar Extension are historic streetcars, from both San Francisco and around the world. The design parameters of the Project would accommodate any of Muni's current fleet, however, the Project is expected to run only the historic streetcars. Streetcars on the Historic Streetcar Extension would operate primarily by line of sight, in which control of the vehicle depends on the driver's field of vision. At intersections controlled by traffic signals, streetcar operators would comply with the same traffic signals as drivers of other motorized vehicles. In some locations, as described above, there would be transit-only signals that give streetcars priority over other traffic; these transit-only signals would be coordinated with the traffic signals.

2.3 PREFERRED ALTERNATIVE

The Preferred Alternative is Alternative 2 – Action Alternative. This alternative was determined after a multi-year selection process and alternative development. Section 2.5 describes the process that preceded the preferred alternative selection by outlining the alternatives considered and dismissed.

The North Loop (Alternative 2A) and South Loop (Alternative 2B) Turnaround Alternatives were analyzed during a 1.5-day Value Analysis (VA) workshop held in August of 2010. During the Value Analysis Workshop, two additional South Loop configurations were discussed at length. One additional option discussed would have located an additional platform within the Fort Mason Center parking lot between the Gatehouse and the tunnel entrance. The second option discussed would have eliminated the platform along Laguna Avenue completely and served passengers exiting at the Fort Mason Center solely from one platform on the northern portion of the South Loop. After further investigation SFMTA staff determined that constructing a platform within the Fort Mason Center parking lot between the Gatehouse and the tunnel entrance would not be feasible due to the dynamic envelop of the vehicles. There is not enough space for two vehicles to fit side by side at the tunnel's west portal so a vehicle leaving the terminal to return towards Fisherman's Wharf would not be able to proceed until the alighting (northern) platform is clear.

In the Value Analysis Workshop, the North Loop and South Loop turnaround alternatives were evaluated using a process called Choosing by Advantages (CBA), where decisions are based on the weighted importance of the advantages between alternatives with capital and life cycle costs factored in last, to illustrate benefits to cost. In using CBA to determine a preferred alternative, the VA team identified the alternative that offers the highest total importance of advantages at the lowest cost (in both initial and life cycle).

In this workshop, the North Loop was identified as best value due to the following advantages:

- Significantly Better at Limiting Disruption to Natural Resources;
  - No impervious surface is added (can increase pervious surface between rail);
  - Does not remove vegetation;
  - Emits the least amount of emissions during construction (less earth moved).
- Somewhat Better at Improving Visitor Experience;
  - Limited view shed impacts by adding streetcars and infrastructure in the Fort Mason Center (FMC) parking lot;
  - Provides direct interior connection between SF Maritime NHP and Fort Mason Center.
- Slightly Better at Protecting Public Health, Safety and Welfare;
  - All the alternatives create potential conflicts between pedestrians, auto and transit. This alternative limits those conflicts particularly with bicycles. It may include conflict with bicycles in the future;
  - Allows for redesign of the Bay Trail with less change required (this is an independent project).
- Slightly Better at Supporting Criteria for Large Events;

- It is best able to manage headway (frequency and storage of streetcars);
- Creates more room to queue visitors away from Laguna Street.

- Somewhat Better at Accessing Disabled Streetcar;
  - Creates better access to disabled streetcar in the storage area for repair via service truck in this location.
- Slightly Better at Minimizing Noise & Sound Impacts;
  - Minimizes noise impacts on residential neighborhoods since it is the farthest from the residential areas;
  - Minimizes vibration impacts. All the options create vibration but this option is 10 feet farther away from the historic structures than the other alternatives.
- Somewhat Better at Attracting New Tenants:
  - This alternative gives Fort Mason Center the ability to attract new tenants (via *Fort Mason Center Long-Term Lease Environmental Assessment*).

2.4 ENVIRONMENTALLY PREFERRED ALTERNATIVE

In accordance with Director's Order #12 and the National Environmental Policy Act, the National Park Service is required to identify the environmentally preferred alternative (NPS 2001a). The Council on Environmental Quality defines the environmentally preferred alternative as "the alternative that will promote the national environmental policy as expressed in the National Environmental Policy Act's Section 101." Under section 101(b) of the act, it is the continuing responsibility of federal agencies to:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;
5. achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Closely mirroring these criteria, particularly criteria #3 and #6, are the project's goals and objectives. Goals and objectives for this project emphasize enhancing visitor experience and reducing automobile-based trips for recreational travel, and inter- and intra-park transportation. Closely examining the degree to which the project alternatives meet these criteria, it has been determined that the environmentally preferred alternative is the Preferred Alternative.

Alternative 1 (the No-Action Alternative) does not meet project goals, purpose, or need and in particular does not "enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources" in that this alternative does nothing to reduce the number of automobiles used to access the park and/or the Fort Mason Center. As will be discussed further in this document, changes to the mix of transportation modes [autos and transit] serving the project area resulting from the Preferred Alternative identified a 14.4 percent increase in transit use for daily person trips to Fort Mason Center between the No Project and implementation of the Project with the F-line extension. The result would be a long-term, moderate, beneficial impact which leads to the conclusion that the Preferred Alternative is the environmentally preferred alternative.

This conclusion is reached looking at current conditions. The environmental preference for an alternative that provides increased transit is further supported by future conditions. The Fort Mason Center Long-Term Lease Environmental Assessment projects an increase in visitor levels by 14.5 percent contingent upon the renovations of Pier One, which is currently not used as an event space. If Pier One was restored, the 2003 EA projected that the 1.6 million annual visitors would be increased to 1.9 million for the entire Fort Mason Center. The EA also states that the increase in visitors from the development of Pier One could increase transit demand. The No-Action Alternative would not provide any increased transit and would not support the goal of "recycling of depletable resources."

During the CBA, the turnaround option Alternative 2A: North Loop was found to be significantly better at limiting disruption to natural resources due to: no addition of impervious surface; no removal of vegetation; and because less earth would be moved, less emissions during construction. Therefore Alternative 2 with the Turnaround option Alternative 2A: North Loop is considered to be the environmentally preferred alternative.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER STUDY

The preliminary alternatives were developed using previous planning studies with agency working group input. The alternatives proposed in the 2004 Feasibility Study were further developed and refined during the environmental review process. Based on the Feasibility Study a number of alternatives were developed and refined before being eliminated. The mode of transportation considered for all alternatives in the Feasibility Study was the streetcar, and all alternatives used the Fort Mason Tunnel. Also, some preliminary on-street design options were considered in the development of the alignment alternatives. The following section outlines the alternatives considered but eliminated from further study. **Table 2-4** summarizes the alternatives considered and dismissed. A detailed description of each alternative and the reason why it was dismissed is included in Appendix A along with Figures (numbers are preceded by the letter 'A') illustrating each of these alternatives.

An initial screening process was undertaken by the TAC for the alignment alternatives. As described in Section 2.1.1 Alternative Development Process, the criteria included:

- **Purpose and Need** – Criteria relating to the Purpose and Need for the project.
- **Park Preservation** – Criteria relating to the various objectives of the National Park Service in operating the national parks through which this project passes.

- **Operability** – Criteria relating to the technical capabilities and limitations of the transit vehicles and infrastructure proposed for use in the various alternatives, and criteria relating to the objectives of the SFMTA in operating the citywide transit system.

2.5.1 Screening Process

The goal of the screening phase of the alternatives analysis is to evaluate all alternatives developed during scoping against a standard set of criteria, and to eliminate alternatives that were unreasonable. Unreasonable alternatives are those that are 1) unreasonably expensive, 2) can't be implemented for technical or logistic reasons, 3) do not meet park mandates, 4) are inconsistent with park statements of purpose and significance, and 5) are inconsistent with park or cooperating agency management objectives. The Council on Environmental Quality (CEQ) defines reasonable alternatives as those that are technically and economically feasible and that show evidence of common sense. They also meet project objectives, resolve need, and alleviate potentially significant impacts to important resources. The steps in this process are as follows:

- Incorporate all feasible alternatives from Feasibility Study (three rail alternatives)
  - Option 1 – Promenade/Beach
  - Option 2 – Victorian Park/Beach
  - Option 3 – Beach 2-way
- Incorporate alternatives suggested in scoping process
  - Option 4 – Rail alternative via North Point, Van Ness, and the tunnel
  - Option 4A – Rail alternative via North Point and Bay
  - Option 5 – Bus alternative via North Point and Bay – extension of the 10-line
  - Option 5A – Bus alternative via North Point, Van Ness, and the tunnel, i.e., extension of Muni's 10-line
  - Option 6 – Trolley coach alternative via North Point, Van Ness and the tunnel
  - Option 6A – Trolley coach alternative via North Point and Bay
- Develop screening criteria
  - Evaluate all alternatives against screening criteria. Alternatives scoring less than 75 percent in screening process are eliminated from further consideration
- Develop screening criteria for secondary screening if more than one alternative scores 75 percent or greater
- Evaluate all remaining alternatives against secondary screening criteria, with a goal of advancing only alternatives with a high likelihood of success
- Define the Build Alternative to be carried forward into the EIS

2.5.2 Feasible Alternatives from Feasibility Study

The Muni E-Line Extension Feasibility Study (WSA, et al. 2004) presented alternatives that were examined in the initial screening process. The screening process resulted in the reduction of nine alignment alternatives to three alignment alternatives (Alignment Options 1, 2 and 3). Table A-1 in Appendix A illustrates the initial screening process.

Further refinements were made during the screening process that involved a number of agency working groups, including the National Park Service, SFMTA, and the TAC. The second screening process reduced the three alignment alternatives to one alignment alternative (Alignment Option 3, which is the design for the Proposed Action discussed above).

The East Segment, from Fisherman's Wharf to the East Portal of the Fort Mason Tunnel (the general location discussed in this EIS) had two sections with eleven options. The West Segment, from the West Portal of Fort Mason Tunnel to the Presidio of San Francisco, had two sections with thirteen options. The Presidio Segment, from Baker Street to Fort Point, had two sections, with ten options. The initial screening resulted in the elimination of seven options from the East Segment, nine options from the West Segment, and seven options from the Presidio Segment (WSA, et al. 2004). The F-line project ends at Fort Mason Center; the West Segment and Presidio Segment are outside the scope of this project.

Three preliminary alignment alternatives, Options E-1, E-2, and E-3 emerged from the evaluation of the remaining alternatives in the East Segment. All three preliminary alignment alternatives would continue through the Fort Mason Tunnel via a transition segment at Aquatic Park. Two transition segment options, #E-3A (1) and #E-3A (2) were developed along Van Ness Avenue at Aquatic Park, one involving the relocation of a retaining wall between Van Ness Avenue and the bocce courts.

At the Fort Mason Turnaround, a number of concepts were examined. Only two concepts were found to meet the operational criteria, Concepts 1 and 2. These alignment alternatives, transition segments, and turnaround concepts were then presented to the public during the EIS scoping period, as Alignment Options 1, 2, and 3, Turnaround Options 1, and 2, and Transition Segments #E-3A(1) and #E-3A (2).

The alignment alternatives, transition segments, and turnaround concepts from the Feasibility Study were renamed and presented as shown in **Table 2-3** and Figures A-1 through A-7 (in Appendix A).

2.5.3 Alternatives Suggested in Scoping Process

Comments received regarding the alternatives presented during the scoping period supported one or more of the alternatives presented. Additionally, a number of comments suggested new alternatives, including extensions of existing diesel and trolley bus routes to Fort Mason. A total of six more alignment alternatives and seven turnaround alternatives were developed as a result of the comments received during the public scoping period. This included consideration of other transit modes such as diesel bus and trolley coach. Four additional turnaround alternatives were subsequently developed

TABLE 2-3: RENAMING OF PRELIMINARY ALTERNATIVES

Preliminary Alternatives from the Feasibility Study (2004)	Preliminary Alternatives for Public Scoping (2006)
Option E-1: Westbound—Jefferson-Promenade/Eastbound Van Ness Beach	Alignment Option 1: Promenade and Beach Street: Jones Street to Van Ness Avenue via Jefferson Street, Promenade, Beach Street
Option E-2: Westbound--Jefferson-Victorian Park-Beach-Van Ness/Eastbound Van Ness-Beach	Alignment Option 2: Victorian Park and Beach Street: Jones Street to Van Ness Avenue via Jefferson Street, Aquatic Park, Beach Street
Option E-3: Westbound/Eastbound--Van Ness Beach	Alignment Option 3: Beach Street: Jones Street to Van Ness Avenue via Jefferson Street, Leavenworth Street, and Beach Street
Concept 1: Fort Mason Loop	Turnaround Option 1: Fort Mason Loop: Turnaround within Fort Mason Center
Concept 2: Beach Street/Yacht Harbor Parking Loop	Turnaround Option 2: Marina Loop: Turnaround on Marina Boulevard
Transition Segment #E3-A(1)	Transition Segment #E3-A(1)
Transition Segment #E3-A(2)	Transition Segment #E3-A(2)

during the project's TAC meetings. Alternative Alignment Options 4[7], 4A, 5, 5A, 6 and 6A and Turnaround Options 1 through 13 were developed to address public scoping comments, but were later dismissed from analysis.

The following **Table 2-4** summarizes all alternatives that were considered and later dismissed. See Appendix A for more detail.

2.6 COMPARISON OF ALTERNATIVES

2.6.1 Alternatives Comparison Matrix

Table 2-5 shows a comparison between the two alternatives based on the elements of the project.

2.6.2 Summary of Impacts and Potential Mitigation

Table 2-6 summarizes the impacts and potential mitigation measures for each resource topic under the two different alternatives. These impacts are analyzed in detail in Chapter 4. Environmental Consequences.

[7] Options 4 and 5 were previously developed in the early stages of the Feasibility Study, but were subsequently dropped from consideration.

Table 2-4: Alternatives Considered and Dismissed

Alternative	Description	Reason for Dismissal
In-Street Segment		
Alignment Option 1: Promenade and Beach Street	Follows historic State Belt Railroad	Not consistent with park management objectives
Alignment Option 2: Victorian Park and Beach Street	Similar to Option 1 but, at Jefferson Street and Hyde Street it leaves the historic State Belt Railroad alignment, turn southward and continues at an angle through Victorian Park	Did not meet park preservation criteria and resulted in a conflict with the purpose and need of the project
Alignment Option 4: North Point via Tunnel	Streetcar alternative; would operate in both directions on North Point Street between Jones Street	Infeasibility
Alignment Option 4A: North Point via Bay	Streetcar alternative; would use Bay Street rather than the Fort Mason Tunnel	Infeasibility and conflicts with the purpose and need of the project
Alignment Option 5: Motor Coach via Bay	Motor coach alternative, extension of the Muni 10-Townsend local bus line, using Bay Street	Infeasibility and conflicts with the purpose and need of the project
Alignment Option 5A: Motor Coach via Tunnel	Motor coach alternative, extension of the Muni 10-Townsend local bus line, using Fort Mason Tunnel	Infeasibility and conflicts with the purpose and need of the project
Alignment Option 6: Trolley Coach via Tunnel	New trolley coach line connecting to the current F-line at Jones Street and Beach Street, uses Fort Mason Tunnel	Infeasibility and conflicts with the purpose and need of the project
Alignment Option 6A: Trolley Coach via Bay	Trolley coach alignment that consists of a new trolley coach line connecting to the current F-line, uses Bay Street	Conflicts with the purpose and need of the project
Transition Segment		
Transition Segment #E-3A (1)	This segment stretches from Fort Mason tunnel east portal to Polk Street in an inverted S-curve shape with double-track alignment with an interlocked track at the entrance to the Fort Mason tunnel	Combined with Transition Segment #E-3A(2) and renamed the Transition Segment Area that is now part of the proposed project
Transition Segment #E-3A (2)	Similar to #E-3A (1) with a dual-side platform station parallel to the existing retaining wall on Van Ness Avenue, north of Option 1 platforms	Combined with Transition Segment #E-3A(1) and renamed the Transition Segment Area that is now part of the proposed project
Transition Segment Option 2	The switch (the transition between double tracks and single tracks) is located on the west side of Van Ness Avenue	Does not conform to SFMTA or San Francisco Maritime NHP management objectives and was not supported for technical reasons
Turnaround Segment[a]		
Turnaround Option 1: Fort Mason Loop	Fort Mason Center parking lot, east of the Fort Mason gates; would operate in a counter-clockwise loop and would bisect the parking control gates as well as cross over the historic trackwork	Infeasibility and conflicts with the purpose and need of the project
[a] Note: Turnaround Options 9 through 12 were mislabeled 10 through 13 on Table A-2 of the Appendix A.		

TABLE 2-4: ALTERNATIVES CONSIDERED AND DISMISSED (CONTINUED)

Alternative	Description	Reason for Dismissal
Turnaround Segment (cont.)		
Turnaround Option 2: Fort Mason Short Loop	Counter-clockwise loop beginning in the Great Meadow; travels through the Fort Mason parking lot, to the south of the Guard House, crosses the Laguna Street and Beach Street intersection	Infeasibility
Turnaround Option 4: East-West Loop	Counter-clockwise loop within Fort Mason Center parking lot with platforms oriented east-west instead of north-south	Infeasibility and failed to meet park management criteria
Turnaround Option 5: North Wye	Wye-shaped track north of the main running track; located in the Fort Mason gates on NPS property; includes two platforms and no storage capability	Infeasibility
Turnaround Option 6: North Wye – Two Tracks	Similar wye-shape as option 5; three platforms ; differs from Turnaround Option 5 by allowing for an extra car at the terminal	Infeasibility
Turnaround Option 7: South Wye	Wye-shaped track to the south of the main running track with two platforms	Infeasibility and failed to meet park management criteria
Turnaround Option 9: Fort Mason Gate Loop	Counter-clockwise loop using the Gas House Cove parking lot for both directions and goes through the Fort Mason gates	Infeasibility and conflicts with the purpose and need of the project
Turnaround Option 10: Safeway Loop	Clockwise loop around the Safeway block within city street ROWs	Infeasibility and conflicts with the purpose and need of the project
Turnaround Option 11[b]: Marina Loop	Counter-clockwise loop using Gas House Cove parking lot (outbound), inbound track on south side of Marina Boulevard	Failed to meet park management objectives
Turnaround Option 12: Small Marina Loop	Clockwise loop using northern side of Marina Boulevard for outbound direction, with a loop in Gas House Cove parking lot	Conflicts with the purpose and need of the project
Fort Mason Turnaround: Modified North Wye – Two Tracks – Option RL	Modified version of Turnaround Option 6: North Wye – Two Tracks	Infeasibility

[b] Formerly Option 2.

TABLE 2-5: ALTERNATIVES COMPARISON SUMMARY

Plan Element	Alternative 1 No Action	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option
In-Street Segment	• No new construction would occur on Beach Street • There would be no loss of parking on Beach Street • No new overhead poles and wires would be installed on Beach Street	• Alignment operates in both directions on Beach Street between Leavenworth Street and the transition at Van Ness Avenue • Semi-exclusive operations along Jefferson Street • Mixed Traffic operation along Leavenworth Street • Cross the existing cable car tracks at Hyde Street • Three new traffic signals and three existing signals added or reconstructed • Mini-high ADA-compliant station platforms • Mixed Traffic/Shared Auto/Streetcar Design Option • Semi-exclusive Eastbound Option	Same as Alternative 2A-North Loop
Transition Segment	• The bocce court would remain in its current location • No modification of retaining walls would occur • No changes would be made to Aquatic Park NHLD	• Traverses NPS property between Beach and Polk Streets and the Fort Mason tunnel's eastern portal at Van Ness Avenue • Transitions the double-track, street-running segment to the east to the NPS property to the west of Polk Street • Two mini-high, ADA-compliant station platforms: one on the east side of the transition segment and one on the west side • The bocce court in Aquatic Park would be retained or relocated • Modification to existing historic retaining walls • Construction of new retaining walls needed to accommodate the streetcar alignment	Same as Alternative 2A-North Loop
Fort Mason Tunnel Segment	The tunnel would not be rehabilitated and would remain closed to use	• Tunnel improvements include: installation of new track and overhead lines and reconstruction of the tunnel interior – including construction of a new tunnel lining • Associated ventilation systems, signals, lighting, and utilities would be installed, including traction power feeders • Additional capacity (e.g. track circuitry and logic controlling the signaling and the interlocking) would need to be built into the system	Same as Alternative 2A-North Loop

Table 2-5: Alternatives Comparison Summary (continued)

Plan Element	Alternative 1 No Action	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option
Turnaround Segment Options	North Loop: • Lower Fort Mason would remain undisturbed (no addition of streetcar tracks; overhead lights and wires; station platforms, etc...) • Retaining walls would remain intact • No changes would be made to the San Francisco Port of Embarkation NHLD South Loop: • The Great Meadow would remain undisturbed (no addition of streetcar tracks; overhead lights and wires; station platforms, etc...) • Retaining walls would remain intact • No changes would be made to the Bay Trail configuration	• Trackage would loop north after it emerges from the Fort Mason Tunnel into the Lower Fort Mason parking lot • A 155-foot-long by 13-foot-wide, ADA-compliant mini-high station platform would be located alongside Building A at the Fort Mason Center • A second optional platform could be placed on the loop's eastern side near the existing east retaining wall • Storage track would be provided adjacent to the NPS gate house	• Trackage would loop south after it emerges from the Fort Mason Tunnel into the Great Meadow • A 155-foot-long by 13-foot-wide, ADA-compliant mini-high station platform would be adjacent and parallel to Laguna Street • Vehicle storage would be on a stub track inside the terminal loop

Table 2-6: Summary of Impacts and Mitigation

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Land Use				
Alternative 1 would result in no direct, indirect impacts to land use	The implementation of Alternative 2 would result in a minor long-term adverse impact to land use practices due to change in land use of the existing site, however the Project would remain consistent with applicable land use plans and policies	The North Loop Turnaround Option would result in a negligible impact to land use	The South Loop Turnaround Option would result in a long-term moderate adverse impact	N/A
Socioeconomics				
Alternative 1 would have no economic impacts to the San Francisco economy	Alternative 2 would have short-term negligible beneficial construction related economic impacts and long-term negligible beneficial operations related economic impacts on the San Francisco economy	The North Loop Turnaround Option would result in negligible positive short-term economic impacts to the City and County of San Francisco economy	The South Loop Turnaround Option would result in negligible positive long-term economic impacts to the City and County of San Francisco economy.	N/A
Transportation and Circulation				
Transit Operations				
Alternative 1 would result in no impacts to transit operations	Alternative 2 would result in a long-term, moderate, beneficial impact	The North Loop Turnaround Option would result in a long-term, moderate, beneficial impact	The South Loop Turnaround Option would result in a long-term, moderate, beneficial impact	N/A
Traffic Safety				
Alternative 1 would result in long-term, minor, adverse impacts to traffic safety conditions	<u>In-Street Segment</u>: long-term, negligible, adverse impact <u>Transition Segment</u>: long-term, minor, adverse impact	The North Loop Turnaround Option would result in a long-term, minor, adverse impact	The South Loop Turnaround Option would result in a long-term, minor, beneficial impact	TRANS-2: Install Wayfinding Devices

TABLE 2-6: SUMMARY OF IMPACTS AND MITIGATION (CONTINUED)

ALTERNATIVE 1 NO ACTION	ALTERNATIVE 2 ACTION ALTERNATIVE	ALTERNATIVE 2A PROPOSED ACTION WITH NORTH LOOP OPTION	ALTERNATIVE 2B PROPOSED ACTION WITH SOUTH LOOP OPTION	MITIGATION MEASURES
Transportation and Circulation (cont.)				
Parking				
Alternative 1 would result in no impacts to parking conditions	The overall impact would be long-term, minor and adverse	The North Loop Turnaround Option would result in a long-term, minor, adverse impact	The South Loop Turnaround Option would not affect parking conditions at Fort Mason Center, and would not displace any parking spaces resulting in no impact	TRANS-3: Reconfigure On-Street Parking Spaces TRANS-4: Implement Parking Time Restrictions
Traffic Flow				
Alternative 1 would result in long-term, minor, adverse impacts to traffic flow	The result with implementation of the Public Realm Plan would be a long-term, minor, adverse impact, and without implementation of the Public Realm Plan would be a long-term, major, adverse impact	N/A	N/A	TRANS-1: Optimize Traffic Signal Timing
Air Quality				
Alternative 1 would result in no short- or long-term air quality or greenhouse gas emission impacts, either beneficial or adverse	Short-term adverse air quality impacts would result from daily maximum construction activities. With implementation of mitigation measures, short-term air quality impacts would be minor to moderate and adverse Alternative 2 would result in negligible to minor beneficial operational impacts to both regional and local air quality as well as greenhouse gas emissions	The North Loop Turnaround Option would result in a net negligible to minor beneficial operational air quality impact. Construction-related GHG emissions are considered a minor adverse impact with respect to global climate change. The North Loop Turnaround Option would result in a minor net beneficial impact to GHG emissions.	The South Loop Turnaround Option would result in a net minor beneficial operational air quality impact. The South Loop option would have the same net minor adverse construction-related GHG emission impact with as would occur with the North Loop Option The South Loop option would have the same net minor beneficial impact with regard to GHG emissions as would occur with the North Loop Option.	AIR-1: Implement BAAQMD Basic Construction Mitigation Measures

Table 2-6: Summary of Impacts and Mitigation (continued)

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Noise and Vibration				
Alternative 1 would result in no new short- or long-term noise or vibration impacts, either beneficial or adverse	Alternative 2 would result in major adverse impacts to the residential units on the corner of Hyde and Beach Streets and at Ghirardelli Square as well as hotels along Beach Street and the Maritime Museum. Impacts would result from construction noise, construction-related vibration, operational noise and operational vibrations. Identified mitigation would reduce these major adverse impacts to the moderate level	The North Loop Turnaround Option would result in the following: Construction Noise: minor adverse impact Construction Vibration: minor adverse impact. Operational Noise: moderate adverse impact Operational Vibration: minor adverse impact similar to existing vibration levels monitored in the area	The South Loop Turnaround Option would result in the following: Construction Noise: minor adverse impact Construction Vibration: minor adverse annoyance impact at the residences on Laguna Street. Operational Noise: moderate adverse impact Operational Vibration: minor adverse impact	NOISE-1: Implement Construction Noise Mitigation NOISE-2: Implement Operational Noise Mitigation VIBR-1: Implement Construction Vibration Mitigation VIBR-2: Implement Operational Vibration Mitigation
Cultural Resources				
Alternative 1 would not result in any new short- or long-term impacts, either beneficial or adverse	Impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features in the In-Street and Transition segments range from negligible to moderate adverse impact, see Table 4.7-1 and Table 4.7-2 for details	The North Loop Turnaround Option would result in impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features range from negligible to moderate adverse impact, see Table 4.7-1 for details	The South Loop Turnaround Option would result in impacts to NRHP-listed, eligible, or contributing building, structure, object, site or cultural landscape features range from negligible to moderate adverse impact, see Table 4.7-2 for details	CUL-1: Measures to mitigate the adverse impacts of the loss of individual resources at Aquatic Park NHL District (stone retaining wall) CUL-2: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the Aquatic Park NHL District CUL 3: Measures to mitigate the adverse impacts of the alteration of individual resources at San Francisco Port of Embarkation U.S. Army NHL District and Fort Mason National Register Historic District CUL 4: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District

Table 2-6: Summary of Impacts and Mitigation (continued)

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Cultural Resources (cont.)				
				CUL-5: Measures to mitigate negligible impacts to archeological resources due to inadvertent discovery during ground-disturbing activities
Recreation and Visitor Use				
Alternative 1 would result in no impacts to recreational opportunities	Alternative 2 would result in short-term and long-term, minor, adverse impacts on recreation and visitor use in the project area	The North Loop Turnaround Option would result in short and long-term minor adverse impacts	The North Loop Turnaround Option would result in short and long-term minor adverse impacts	REC-1: If necessary, relocate the bocce ball courts to suitable location REC-2: Post signage to direct Bay Trail users of temporary re-routes. REC-3: Coordinate the Bay Trail reroutes with Association of Bay Area Governments (ABAG)
Visual and Aesthetic Resources				
Alternative 1 would result in no direct, indirect, or cumulative impacts to visual resources	Alternative 2 would result in a long-term moderate adverse impact	The North Loop Turnaround Option would result in long-term minor and moderate, adverse effects	The South Loop Turnaround Option would result in long-term minor and moderate, adverse effects	VIS-1: Install temporary visual screening during construction. VIS-2: To the extent feasible, construction staging areas shall be located to the largest extent possible away from view of public viewsheds and remain clear of all trash, weeds and debris etc. VIS-3: Signs will be limited to the minimum necessary to meet information, warning, and regulatory needs and to avoid confusion and visual intrusion.
Night Sky Visibility and Light Pollution				
Alternative 1 would result in no direct or indirect, impacts to night sky visibility	Alternative 2 would result in long-term minor impacts due to increased night lighting	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	NIGHT-1: The project would be required to minimize the use of lighting in areas already well lit and to use full cutoff light fixtures throughout the project.

Table 2-6: Summary of Impacts and Mitigation (continued)

Alternative 1 No Action	Alternative 2 Action Alternative	Alternative 2A Proposed Action with North Loop Option	Alternative 2B Proposed Action with South Loop Option	Mitigation Measures
Geology, Soils, and Seismicity				
Alternative 1 would result in negligible impacts with respect to soil erosion and seismic or landslide events for all segments of the alternative, except for the Fort Mason Tunnel Segment, which could experience a moderate, long-term, adverse impact from dynamic settlement caused by a design-basis earthquake. This moderate impact would be reduced to minor intensity with implementation of the proposed mitigation measure(s).	Alternative 2 would result in minor adverse effects	The North Loop Turnaround Option would result in minor adverse effects after implementation of mitigation measure GEO-3.	The South Loop Turnaround Option would result in minor adverse effects after implementation of mitigation measure GEO-2.	GEO-1: Conduct further analyses to determine whether or not the tunnel is vulnerable to additional damage due to compaction of soil during an earthquake GEO-2: Slope stability evaluation and adherence to California Building Code GEO-3: Fort Mason Tunnel rehabilitation
Biological Resources				
Alternative 1 would result in no measurable change to vegetation, wildlife, or special-status species (if present)	Alternative 2 would result in negligible impacts to biological resources after implementation of the mitigation measures BIO-1 and BIO-2, construction and operation impacts	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	BIO-1: Preconstruction Nesting Bird Surveys BIO-2: Preconstruction Roosting Bat Surveys
Public Health and Safety				
Alternative 1 would result in no direct or indirect impacts to public health and safety	Alternative 2 would result in a short-term, minor, adverse impact	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	HEA-1: Pre-Construction Hazardous Materials Assessment HEA-2: Soil and Groundwater Management Plan HEA-3: Health and Safety Plan (HSP)
Public Services and Utilities				
Alternative 1 would result in no impacts to public services or utilities under this alternative	Alternative 2 would result in moderate adverse impacts	Same as Alternative 2 Action Alternative conclusions	Same as Alternative 2 Action Alternative conclusions	PUB-1: Maintain Utility Services

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Chapter 3
Affected Environment

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the affected elements of the natural, social, and economic environments that might be affected by the Extension of F-Line Streetcar project. Emphasis is placed on the current status of each element and any trends that may be evident. This chapter also contains applicable regulations on the federal, state, and local level that would apply to the Project. The environmental resources discussed in this chapter are the same and presented in the same order as in Chapter 4, Environmental Consequences.

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3.2 LAND USE

3.2.1 Introduction

The study area for the Project is located within the northeastern portion of the City and County of San Francisco, within close proximity to the waterfront of the San Francisco Bay. This area includes both NPS lands as well as portions of the City of San Francisco. The study area boundary runs from the corner of Mason and Bay Streets to the east, along Bay Street, to the corner of Fillmore Avenue and Bay Street to the west (see Figure 1-2). The northern portion of the project study area extends out into San Francisco Bay and encompasses the entire shoreline from the corner of Fillmore Avenue and Marina Boulevard to just east of Fisherman's Wharf. Located within this study area are Fisherman's Wharf, Aquatic Park (a National Historic Landmark), Fort Mason (including the San Francisco Port of Embarkation National Historic Landmark), and the eastern-most portion of the Marina Green.

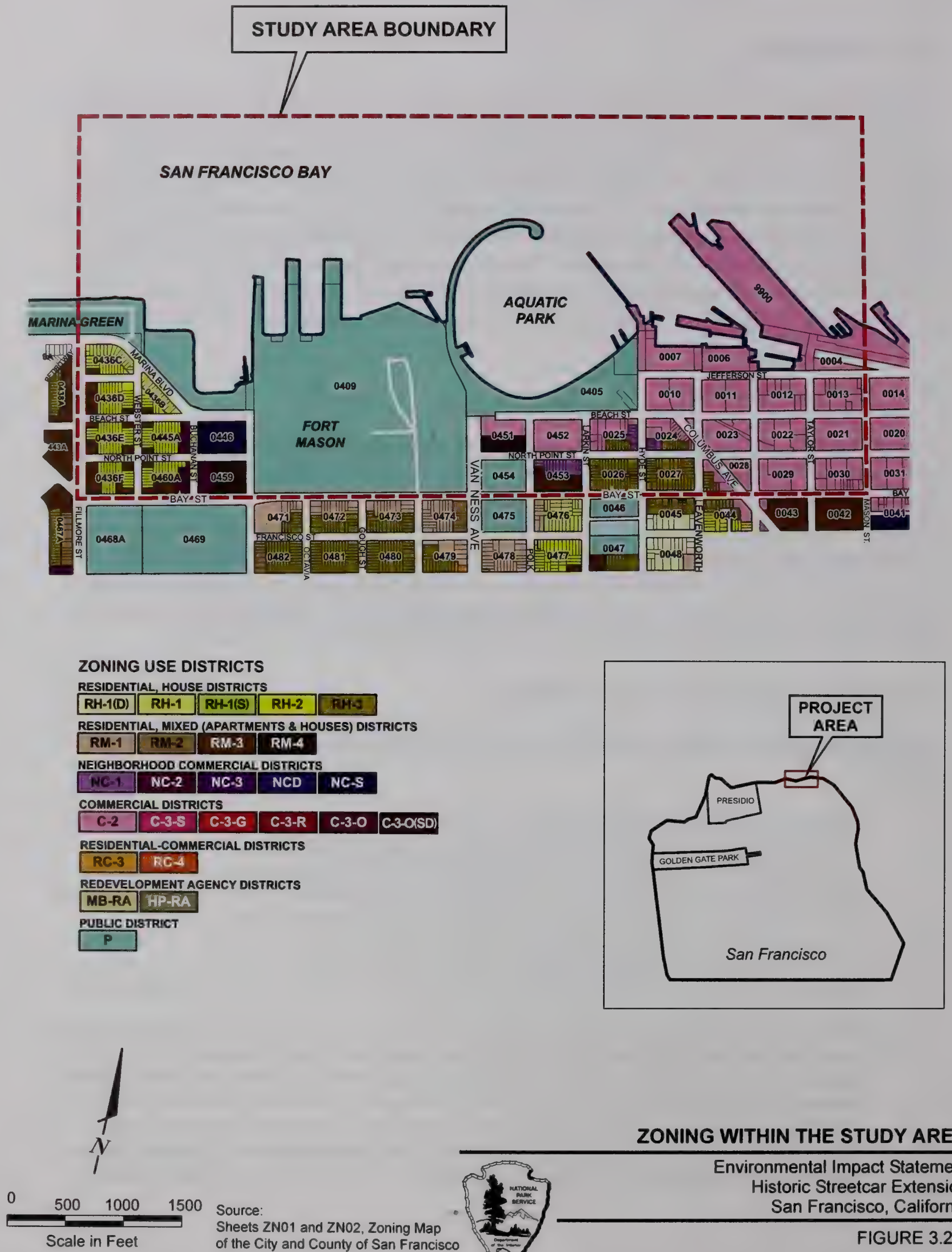
3.2.2 Existing Conditions

Regional access to the area is via Interstate 80, Highway 101, Highway 280 and Highway 1; with local access provided by a number of arterial roads such as Bay Street, Beach Street, North Point Street, Marina Boulevard, and The Embarcadero. The project study area includes a number of diverse land uses within a relatively small area. Currently within the project study area, the F-line train operates along Jefferson and Beach Streets, between Mason and Jones Streets. The following information from the City of San Francisco's Municipal Code provides a detailed description of existing conditions within the project study area by zoning code block number and land use designation (CCSF 2010). Refer to **Figure 3.2-1** for the locations of the block numbers within the project study area.

Project Study Area Zoning: City of San Francisco

Blocks 0436C-0436F and 0445A, 0460A. These blocks hold the following zoning designations: RH-2 and RM-3.

- RH-2 refers to *Residential-House Districts, Two Families*. These districts are devoted to one-family and two-family houses, with the latter commonly consisting of two large flats, one occupied by the owner and the other available for rental. Structures are finely scaled and usually do not exceed 25 feet in width or 40 feet in height. Building styles are often more varied than in single-family areas, but certain streets and tracts are quite uniform. Considerable ground-level open space is available, and it frequently is private for each unit. The districts may have easy access to shopping facilities and transit lines. In some cases, group housing and institutions are found in these areas, although nonresidential uses tend to be quite limited.
- RM-3 refers to *Residential-Mixed Districts, Medium Density*. These districts have some smaller structures, but are predominantly devoted to apartment buildings of six, eight, 10 or more units. Most of these districts are close to downtown and have been developed in this manner for some time. The units vary in size, but tend to be smaller than in RM-1 and RM-2 Districts. Many buildings exceed 40 feet in height, and in some cases additional buildings over that height may be accommodated without disruption of the district character. Although lots and buildings wider than 25 or 35 feet are common, the scale often remains moderate through



Source:
Sheets ZN01 and ZN02, Zoning Map of the City and County of San Francisco Planning Department, 2009 and 2010

ZONING WITHIN THE STUDY AREA

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 3.2-1

sensitive facade design and segmentation. Open spaces are smaller, but decks and balconies are used to advantage for many units. Supporting nonresidential uses are often found in these areas.

Blocks 0446 and 0459. Blocks 0446 and 0459 currently hold the following zoning designations: NC-3, NC-S and RM-4.

- **NC-3** refers to *Moderate-Scale Neighborhood Commercial District.* For specific zoning constraints for this designation refer to the San Francisco Zoning Code.
- **NC-S** refers to *Neighborhood Commercial Shopping Center District.* For specific zoning constraints for this designation refer to the San Francisco Zoning Code.
- **RM-4** refers to *Residential-Mixed Districts, High Density*. These districts are devoted almost exclusively to apartment buildings of high density, usually with smaller units, close to downtown. Buildings over 40 feet in height are very common and other tall buildings may be accommodated in some instances. Despite the intensity of development, distinct building styles and moderation of facades are still to be sought in new development, as are open areas for the residents. Group housing is especially common in these districts, as well as supporting nonresidential uses.

Blocks 0409, 0405 and 0454. These Blocks currently hold the following zoning designation: P

- **P** refers to Public Use District. For specific zoning constraints for this designation refer to the San Francisco Zoning Code.

Blocks 0451-0453, 0024-0027, 0007 and 0010. These Blocks currently hold the following zoning designations: RM-3 and RM-4, C-2, NC-1, and RH-3

- RM-3 and 4 are described above.
- C-2 refers to Community Business District. Generally, this designation has a maximum dwelling unit density of one dwelling unit per 800 square feet of lot area and a basic floor area ratio of 3.6 to 1. Areas with this designation are permitted to provide shopping goods and services. Uses such as retail, office restaurant, and residential are permitted in these areas.
- NC-1 refers to Neighborhood Commercial Cluster District. For specific zoning constraints for this designation refer to the San Francisco Zoning Code.
- RH-3 refers to Residential-House Districts, Three Families. These districts have many similarities to RH-2 Districts, but structures with three units are common in addition to one-family and two-family houses. The predominant form is large flats rather than apartments, with lots 25 feet wide, a fine or moderate scale and separate entrances for each unit. Building styles tend to be varied but complementary to one another. Outdoor space is available at ground level, and also on decks and balconies for individual units. Nonresidential uses are more common in these areas than in RH-2 Districts.

Blocks 0004, 0006, 0011-0013, 0021-0023, and 0028-0030. These Blocks currently hold the following zoning designations: C-2.

- C-2 is described above.

Golden Gate National Recreation Area General Management Plan (1980). The GMP identifies specific zone designations within the park and provides guidance on management actions in those areas.

Urban Landscape Subzone. West Fort Mason is a part of the subzone of the Intensive Landscape Management Zone. This subzone is characterized by familiar elements found in traditional city parks – well tended trees, shrubs, flowers, irrigated an mowed lawns, and hard-surfaced areas for walking and congregating. These areas are designed for intensive use and should look complete only when filled with people. Primary resource management activities will include mowing, irrigation, weeding, fertilization, replanting, and trash pickup.

Enhancement Zone. Aquatic Park is part of this subzone under the Historic Resource Zone, which was developed originally as a recreational space and still derives its primary value from recreation use.

Adaptive Use Zone. North and east Fort Mason are a component of this subzone under the Historic Resource Zone. This subzone defines structures or spaces of historic value that have been or will be adapted for recreation, park management, and related activities. Although as much historic integrity as possible will be retained throughout all areas of the park, the interior spaces of structures included in this zone may be modified considerably to accommodate recreation, education and other park-related uses.

3.2.3 Project Study Area Land Use

The land uses within the project study area are a mix, consisting of General Commercial, Public Trust, Public, High Density Residential, Moderately Low Residential and Community Business. The study area west of Fort Mason is primarily in residential and commercial use. Fort Mason itself and the Marina Green are public areas which consist primarily of open space; although a number of residences are located at Fort Mason. Aquatic Park is located east of Fort Mason and is also a public area juxtaposed with a number of mixed commercial and residential areas. The eastern-most portion of the study area from Bay Street north to Fisherman's Wharf is entirely commercial. **Figure 3.2-2** depicts the current land use designations within the project study area. What follows below is a description of existing land use designations within the project area, broken down by zoning block groups. Refer to Figure 3.2-1 to reference and locate specific block numbers.

Blocks 0004, 0006, 0007, 0010-0013, 0021-0024, 0027-0030, and 9900 (Fisherman's Wharf Area). These Blocks currently have a land use designation of General Commercial.

Blocks 0025, 0026 (Van Ness Corridor Area). These Blocks currently have a land use designation of Moderately Low Residential.

Blocks 0451-0454 (Van Ness Corridor Area). These Blocks currently have a land use designation of High Density Residential.

Blocks 0405 and 0409 (Fort Mason and Aquatic Park Areas). These Blocks currently have a land use designation of Public and encompass Fort Mason and Aquatic Park.

NORTHEASTERN WATERFRONT LAND USE MAP

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FIGURE 3.2-2

3.2.4 Regulations and Policies

The following state and local regulations govern the review and analysis of land use in the study area.

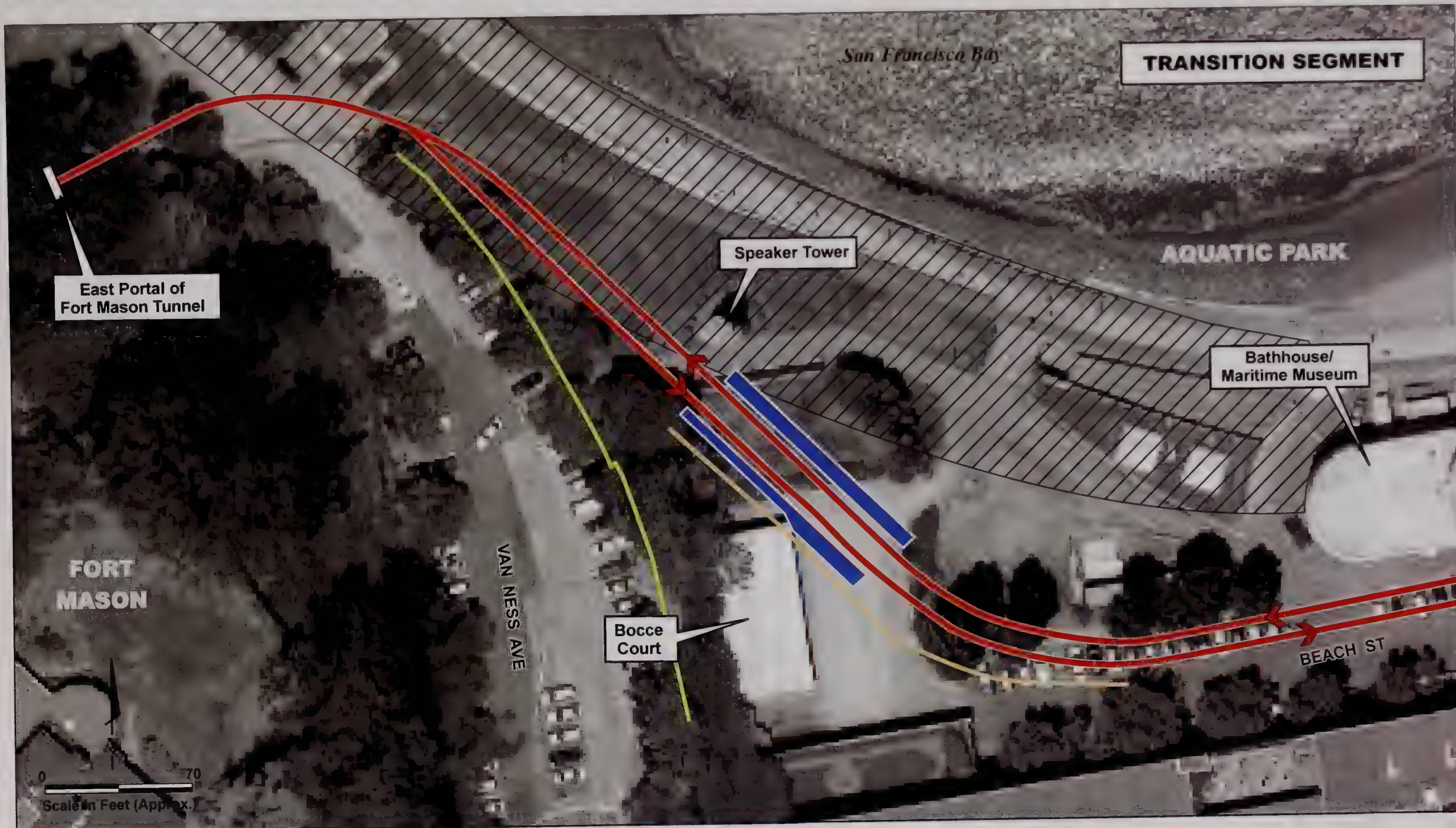
State and Regional Guidelines

The McAteer-Petris Act (1965). The McAteer-Petris Act (Cal. Govt. Code Sections 66600–66694) is the California state law that established the San Francisco Bay Conservation and Development Commission (BCDC) as a state agency; prescribes the Commission's powers, responsibilities and structure; and describes the broad policies the Commission must use to determine whether permits can be issued for activities in and along the shoreline of San Francisco Bay. This law was first enacted on September 17, 1965, to establish BCDC as a temporary state agency and amended in August 1969 to make BCDC a permanent agency and to incorporate the policies of the *San Francisco Bay Plan* into state law. The law has subsequently been amended several times.

San Francisco Bay Plan (2003). The San Francisco Bay Conservation and Development Commission (BCDC) is a state agency with the authority to issue or deny permit applications for placing fill, extracting minerals, or changing the use of any land, water, or structure within the San Francisco Bay. The San Francisco Bay Plan, adopted in 1968 by BCDC and last amended in 2006, includes policies to guide future uses of the Bay and shoreline and includes a set of maps which show where the policies should apply to the present Bay and shoreline.[1] The plan area's jurisdiction is defined as the San Francisco Bay, a band of land 100 feet or 30 meters from the shoreline of the San Francisco Bay, saltponds, managed wetlands and certain specified waterways. **Figure 3.2-3** shows the area within the Transition Segment that falls within the 100-foot boundary. The project alternative which proposes a portion of the railway to travel along the Aquatic Park promenade is within the jurisdiction of the San Francisco Bay Plan. According to the BCDC, *nearly all work, including grading, on land within 100 feet of the Bay shoreline needs permit approval.* With regards to federal projects, the Coastal Zone Management Act allows the Commission to review federal projects and projects that require federal approval or federal funding; a process known as "federal consistency". However, the Commission cannot require federal agencies to submit permit applications and cannot impose conditions on its federal consistency decisions. Nevertheless, the federal agencies and applicants for federal approvals must provide the project's details and data to assure that the Commission has the information it needs to evaluate the project (BCDC 2007). The following policies from the Bay Plan are applicable to the project study area.

- **Policy 1** – Because of the continuing vulnerability of the Bay to filling for transportation projects, the Commission should continue to take an active role in Bay Area regional transportation and related land use planning affecting the Bay, particularly to encourage alternative methods of transportation and land use planning efforts that support transit and that do not require fill. The Metropolitan Transportation Commission, the California Department of Transportation, the California Transportation Commission, the Federal Highway Administration, county congestion management agencies and other public and private transportation authorities should avoid planning or funding roads that would require fill in the Bay and certain waterways.

[1] San Francisco Bay Plan, Adopted 2003.



Source: NPS; Google Earth 2009.

LEGEND

- Proposed Streetcar Alignment
- Platform
- Existing Retaining Wall
- Proposed Retaining Wall
- 100-foot Shoreline Buffer

SAN FRANCISCO BAY PLAN SHORELINE BUFFER IN TRANSITION SEGMENT AREA

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FIGURE 3.2-3

- **Policy 4** – Transportation projects on the Bay shoreline and bridges over the Bay or certain waterways should include pedestrian and bicycle paths that will either be a part of the Bay Trail or connect the Bay Trail with other regional and community trails. Transportation projects should be designed to maintain and enhance visual and physical access to the Bay and along the Bay shoreline.

Local Guidelines

This section describes various elements of the City and County of San Francisco's General Plan, as well as Specific Area Plans that contain adopted land use policies applicable to the project study area. The General Plan elements reviewed include the Urban Design Element. The Area Plans reviewed include Northeastern Waterfront, Van Ness Avenue, Waterfront Land Use Plan by the Port of San Francisco, San Francisco Waterfront Special Area Plan, and the San Francisco Bicycle Plan.

City of San Francisco General Plan (1996) – Urban Design Element. The Urban Design Element concerns the physical character and order of the city, and the relationship between people and their environment.[2] The following policies are applicable to the project study area.

- **Policy 2.1** – Preserve in their natural state the few remaining areas that have not been developed by man.
- **Policy 2.2** – Limit improvements in other open spaces having an established sense of nature to those that are necessary, and unlikely to detract from the primary values of the open space.

Northeastern Waterfront Area Plan (1998). The Northeastern Waterfront Area Plan, which is an Area Plan of the San Francisco General Plan, recommends objectives and policies designed to contribute to the waterfront's environmental quality, enhance the economic vitality of the Port and the City, preserve the unique maritime character, and provide for the maximum feasible visual and physical access to and along the Bay.[3] Within the project area, everything east of the boundary of San Francisco Maritime National Historical Park (Hyde Street) falls within the jurisdiction of the Northeastern Waterfront Area Plan (see Figure 3.2-2). The following policies are applicable to the project study area.

- **Policy 7.3** – Connect the recreation and open space facilities of the Northeastern Waterfront with those of the Golden Gate National Recreation Area.
- **Policy 9.5** – Improve transit service to, and along, the Northeastern Waterfront. Provide a connection between the F-line and the MUNI Metro Extension to allow for continuous transit rail service in an exclusive right-of-way along the Embarcadero between Fisherman's Wharf and China Basin, which also connects with or provides easy transfers to numerous other transit lines.
- **Policy 31.3** – Provide rail transit service in an exclusive transit way from Fort Mason to the Southern Pacific Depot. An extension of Market Street surface rail, the F-line should operate north of Market Street; the vehicles should be historic in character in order to provide a special waterfront transit identity. South of Market Street the transit service should be a surface extension of the MUNI Metro. Allow for continuous rail transit service along the length of the waterfront.

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[2] San Francisco General Plan, Urban Design Element, Adopted 1996.

[3] San Francisco General Plan, Northeastern Waterfront Area Plan, first adopted 1977, amended 1998.

Port of San Francisco's Waterfront Land Use Plan (1997). The Waterfront Plan sets forth land use policies for all property under the jurisdiction of the Port of San Francisco, which are consistent with the Port's public trust responsibilities and the City's Northeastern Waterfront Plan. The goals of the Waterfront Land Use Plan are to maintain and improve the working waterfront, a revitalized Port, a diversity of activities and people, access to and along the waterfront, an evolving waterfront mindful of its past and future, urban design worthy of the waterfront setting, and economic access that reflects the diversity of San Francisco.[4] The area from Fisherman's Wharf west to Aquatic Park falls within the jurisdiction of the Waterfront Land Use Plan (see **Figure 3.2-4**). The plan contains no specific policies or recommendations applicable to the proposed project.

Van Ness Avenue Area Plan (1995). The Van Ness Avenue Plan provides guidance and direction on physical arrangement of development along the Van Ness corridor. The Van Ness Area Plan was adopted in 1995. Of the three sub-areas identified along the Van Ness corridor, Sub-area 3, which encompasses the portion of Van Ness Avenue between Bay Street and Beach Street, pertains to the study area. The following policy is applicable to the project study area.

- **Policy 3.2** – Support National Park Service plans for improvements of the area within the boundaries of the Golden Gate National Recreation Area (GGNRA).

San Francisco Waterfront Special Area Plan (2000). The San Francisco Waterfront Special Area Plan, developed by the BCDC, is an amendment to the Bay Plan. The Special Area Plan does not supersede the San Francisco Bay Plan, rather in reconciles the differences between the Bay Plan and the Port's Waterfront Land Use Plan. Any new development proposed for the area within the BCDC's jurisdiction must be consistent with the San Francisco Bay Plan and the Waterfront Special Area Plan. The Special Area Plan recommends uses for the land and water located along the existing San Francisco shoreline, from the Hyde Street Pier to India Basin, including all areas within the jurisdiction of the Port of San Francisco. The plan was developed to help public agencies and private parties seeking BCDC permits identify when and where fill, dredging or changes in land use appear to be consistent with the Bay Plan.[5] The project study area lies within the plan boundaries from Fisherman's Wharf to the Hyde Street Pier. The plan contains no specific policies or recommendations about transportation services in general or the proposed project.

San Francisco Bicycle Plan (2009) - District 2. The San Francisco Bicycle Plan adopted in 2009 presents guidelines for the City to provide the safe environment and infrastructure needed to promote bicycling as a transportation mode. The bike plan is a comprehensive review of policies, procedures, practices and physical infrastructure of the city with respect to bicycling.

Project Study Area Bicycle Routes, Paths and Lanes. The project study area is located in District 2 and is serviced by San Francisco Bicycle Route 2. Route 2 includes bicycle lanes along North Point Street, from the Embarcadero to the east to the corner of Van Ness Avenue and North Point to the west. At this corner, Route 2 turns north on Van Ness Avenue then connects to a path through Fort Mason and extends to the Golden Gate Bridge. Route 2 is not a dedicated bicycle lane; bicyclists must share the road with automobiles.

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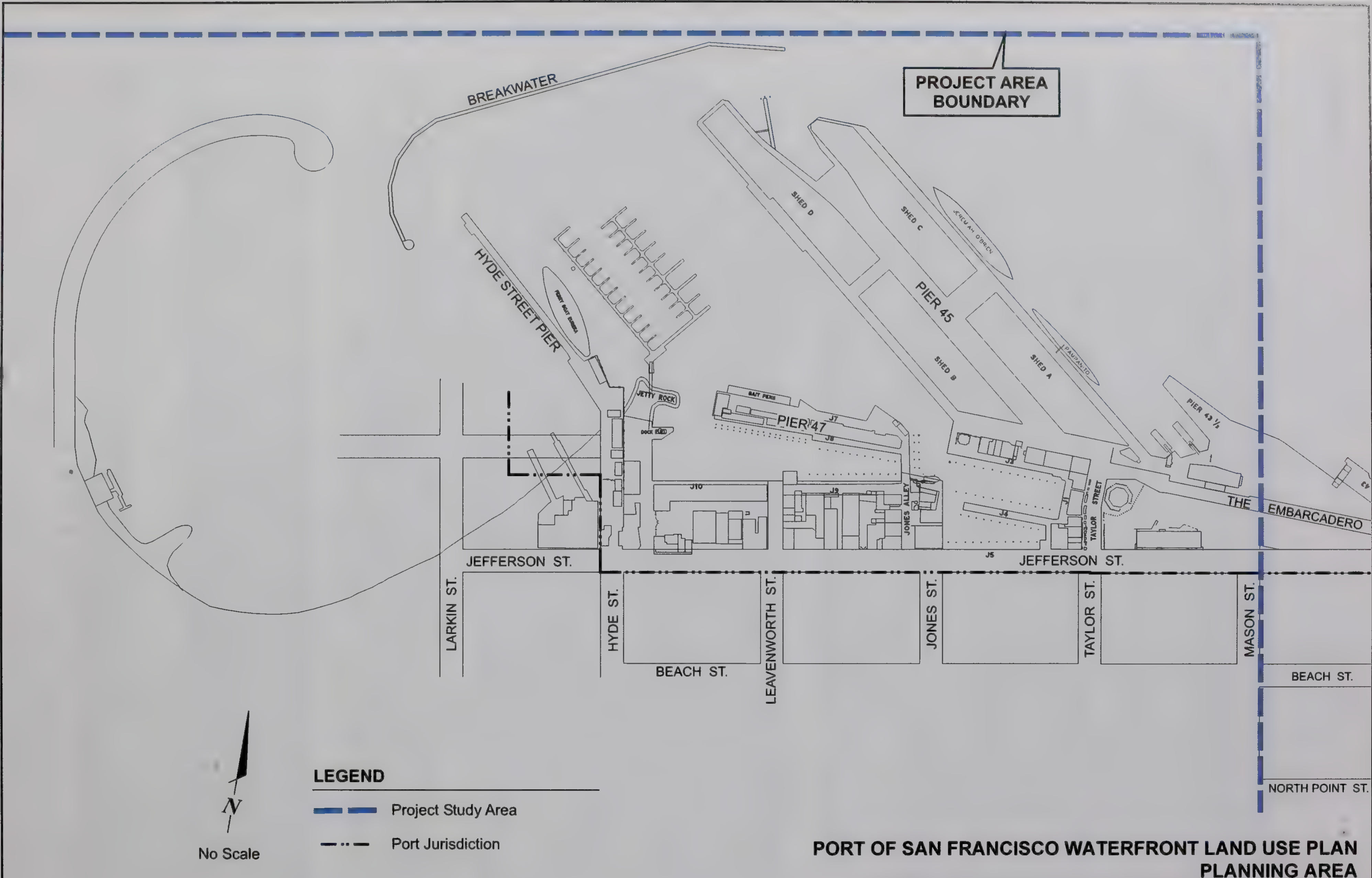
[4] Port of San Francisco's Waterfront Land Use Plan, Adopted 1997.

[5] San Francisco Waterfront Special Area Plan, Adopted 2000.



PORT OF SAN FRANCISCO WATERFRONT LAND USE PLAN PLANNING AREA

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FIGURE 3.2-4

Source:
Port of San Francisco
Department of Engineering, 2002

Within the project study area, dedicated bike lanes are located along Polk Street from Bay Street to Beach Street. The designations of "dedicated" refers to a separate, striped bicycle lane apart from automobile traffic lanes. Normally, these dedicated bicycle lanes are located on the far right hand side of any street.

In June 2009, the San Francisco Municipal Transportation Agency (SFMTA) adopted the 2009 San Francisco Bicycle Plan. This plan designates a number of physical streetscape changes for the sake of bike improvements (such as parking removal and lane re-allocation, even shared-lane "sharrows" and U-rack bike parking racks) that are currently either under way or under consideration.

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3.3 SOCIOECONOMICS

This section describes the existing social and economic conditions in the vicinity of the project area providing background information and establishing the regional context for the study area. This section describes existing economic and demographic conditions at both a local and city/county level.

3.3.1 Introduction

Socioeconomic issues relevant to the evaluation of environmental impacts include population, housing, ethnicity of population, income and employment.

3.3.2 Regional Setting

The proposed project is located in the City and County of San Francisco. The project's local study area consists of the Census Tracts 101, 102, 103, 126. The local study area is shown in **Figure 3.3-1** (Census Tract Boundaries).

Population. The historical population of the study area is shown in **Table 3.3-1**. Between 1990 and 2000, the City and County of San Francisco grew by 7.3 percent while the local area's population increased by approximately 4.2 percent.

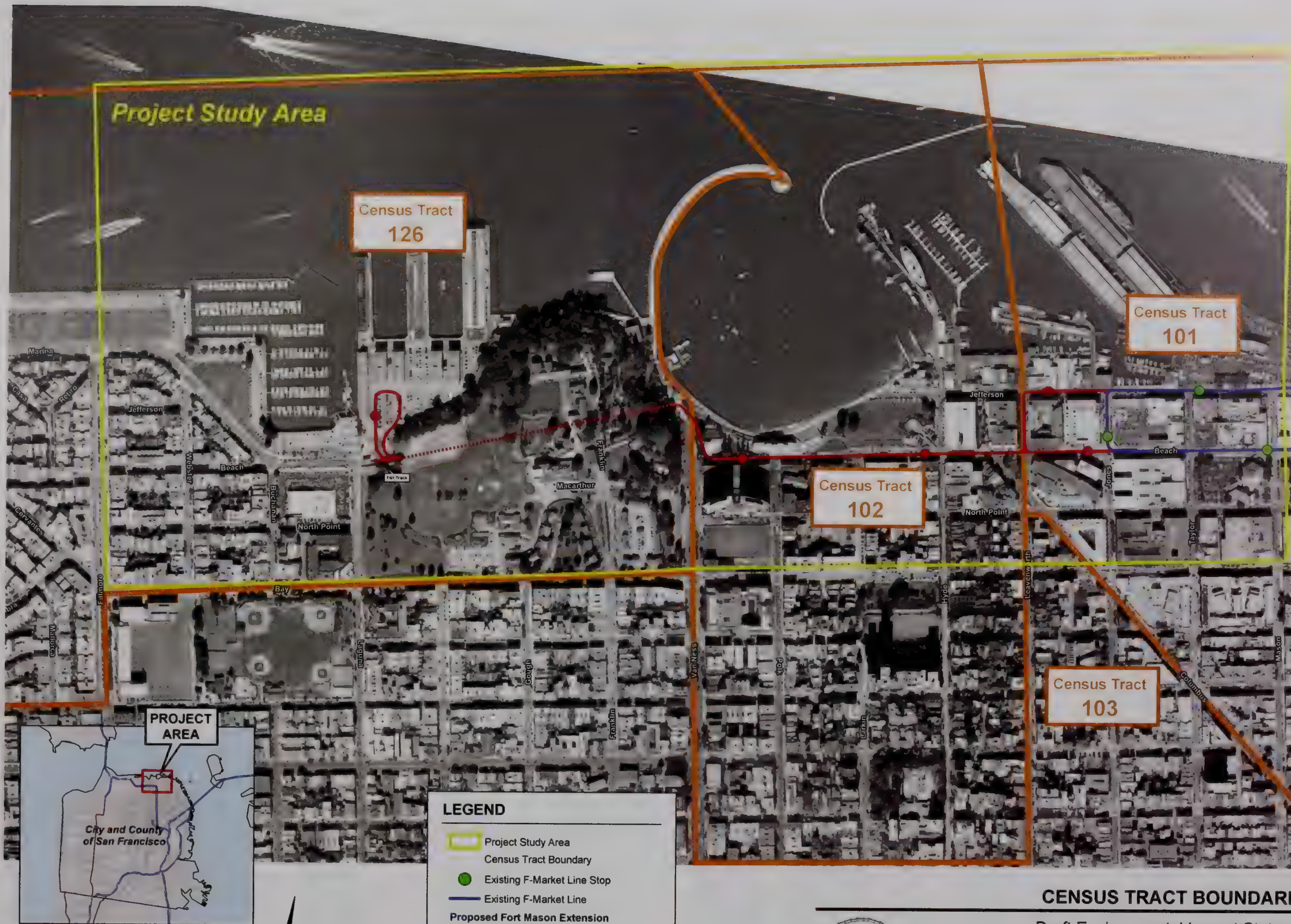
TABLE 3.3-1: HISTORICAL POPULATION

Year	The City and County of San Francisco	Local Study Area
1990	723,959	15,517
2000	776,733	16,174
Growth 1990 to 2000	7.3%	4.2%
NOTE: The local study area consists of the Census Tracts, 101,102,103 and 126. SOURCE: U.S. Census 2000 & 1990.		

Table 3.3-2 shows the existing and projected population for the City of San Francisco which is expected to grow by 19.6 percent between 2010 and 2035.

TABLE 3.3-2: EXISTING AND PROJECTED POPULATION

Area	2010	2015	2025	2035	Projected Growth 2010-2035
The City and County of San Francisco	810,000	837,500	900,500	969,000	19.6%
SOURCE: ABAG 2009.					



LEGEND

Project Study Area
Census Tract Boundary
Existing F-Market Line Stop
Existing F-Market Line
Proposed Fort Mason Extension
Above ground
Underground
Proposed Fort Mason Extension Stop

CENSUS TRACT BOUNDARIES

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FIGURE 3.3-1

Source: NPS

Demographics

Nearly half of the population of the City and County of San Francisco is White (49.7 percent) and over three quarters of the local study area's population is White (76 percent) (U.S. Census 2000).[1]

The City and County of San Francisco has a substantially higher proportion of residents living in poverty (11.3 percent) than the local study area (5.9 percent).

Housing. The historical housing distribution for the City and County of San Francisco and the local study area is shown in **Table 3.3-3**. The housing stock in the City and County of San Francisco increased by approximately 5.5 percent between 1990 and 2000 and vacancy rates also decreased slightly. The number of housing units in the local study area also rose slightly (3.2 percent) and vacancy rates decreased over the same period.

TABLE 3.3-3: HISTORICAL HOUSING DISTRIBUTION

Area	Year	Housing Distribution			
		Housing Units	Occupied Housing	Vacant Housing	% Vacant
The City and County of San Francisco	1990	328,471	305,584	22,887	7.0%
	2000	346,527	329,700	16,827	4.9%
Local Study Area	1990	10,401	9,220	1.181	11.4%
	2000	10,739	9,847	892	8.3%

NOTE: The local study area consists of the Census Tracts 101,102,103 and 126.
SOURCE: U.S. Census 2000 & 1990.

Existing and projected households within the Study Area are shown in **Table 3.3-4**. Housing is projected to grow in the City and County of San Francisco by 19.7 percent between 2010 and 2035.

TABLE 3.3-4: EXISTING AND PROJECTED HOUSEHOLDS

Area	2010	2015	2025	2035	Projected Growth 2010-2035
The City and County of San Francisco	346,680	359,170	386,600	415,000	19.7%

SOURCE: ABAG 2009.

[1] According to U.S. Census Bureau data, the Latino populations are not an official ethnic category due to reporting inaccuracies. Often, Latinos self-report themselves as being a part of another ethnic category, mostly white. Within the City of San Francisco 14.1 percent of residents reported themselves as Latino.

Employment. Historic labor force and unemployment rates for the local study area are illustrated in **Table 3.3-5**. The civilian labor force grew in the City and County of San Francisco between 1990 and 2000 and its civilian unemployment rate decreased by approximately three percent. There was also a decrease in the unemployment rates for the local area. In May 2010, the unemployment rate in San Francisco was 9.6 percent and was considerably lower than the statewide unemployment rate of 11.9 percent (California EDD 2010).

TABLE 3.3-5: HISTORIC LABOR FORCE AND EMPLOYMENT

Area	Year	Civilian Labor Force	Civilian Employment	Civilian Unemployment Rate
The City and County of San Francisco	1990	417,147	386,530	6.2%
	2000	448,432	427,823	3.0%
Local Study Area	1990	9,666	9,316	3.6%
	2000	10,859	10,572	2.6%
SOURCE: U.S. Census 2000 & 1990.				

The existing and projected jobs for the City and County of San Francisco are illustrated in **Table 3.3-6**. Jobs are projected to grow in the City and County of San Francisco by 41.9 percent from 2010 to 2035.

TABLE 3.3-6: EXISTING AND PROJECTED JOBS

Area	2010	2015	2025	2035	Projected Growth 2010-2035
The City and County of San Francisco	568,730	606,540	694,830	806,830	41.9%
SOURCE: ABAG 2009.					

The local study area encompasses part of Fisherman's Wharf. Fisherman's Wharf is a bustling tourist attraction filled with a variety of hotels, restaurants, shops, wholesalers, non-profit organizations, and private offices. The study area also encompasses part of San Francisco's Marina District and two national parks: Fort Mason, Headquarters for the Golden Gate National Recreation Area and the San Francisco Maritime National Historical Park. There are over 337 businesses within the study area that cater to a variety of local and tourist interests and needs.

Local Business. Numerous businesses are located within Fisherman's Wharf. In addition, the San Francisco Arts Commission licenses approximately 430 street artists to sell their goods at 370 sidewalk locations around the City. The selling area spaces are assigned daily by a lottery system to ensure that all vendors have an opportunity to occupy the best locations.

The selling area spaces along Justin Herman Plaza and along Beach Street near the Cable Car are the most popular amongst the street vendors due to the large amount of pedestrian tourist traffic in these areas. As a result these locations are typically occupied year round (weather permitting).

The San Francisco Arts Commission also offers street artist booth areas elsewhere within Fisherman's Wharf . The selling spaces further west on Beach (i.e. near the Larkin Street intersection) and to the east near Columbus Avenue and these locations are less popular than the Hyde Street corner spaces. Additional selling spaces are also located nearby along Hyde and Leavenworth Streets (both between Beach and Jefferson Streets) as well as a small number of spaces along Jefferson Street. Altogether there are approximately 110 selling spaces in the Fisherman's Wharf area of which approximately 61 percent are located along Beach Street. Of these, the majority (approximately 45 designated spaces) are located between Larkin and Hyde Streets (San Francisco Arts Commission 2010).

The San Francisco Arts Commission also offers street artist booth areas elsewhere in the City including along Market Street and around Union Square. These other locations are generally less desirable and consequently are less regularly occupied. Approximately 25 percent of the City's assigned selling spaces are generally unused due to their location. Nonetheless, within popular tourist areas such as Fisherman's Wharf nearly all the available spaces are typically occupied on weekends and during the high season (San Francisco Arts Commission 2010).

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3.4 TRANSPORTATION AND CIRCULATION

3.4.1 Introduction

This chapter identifies the existing transportation conditions to provide a basis for assessing the transportation impacts associated with the proposed historic streetcar extension alternatives. The transportation and circulation study area is shown in **Figure 3.4-1**.

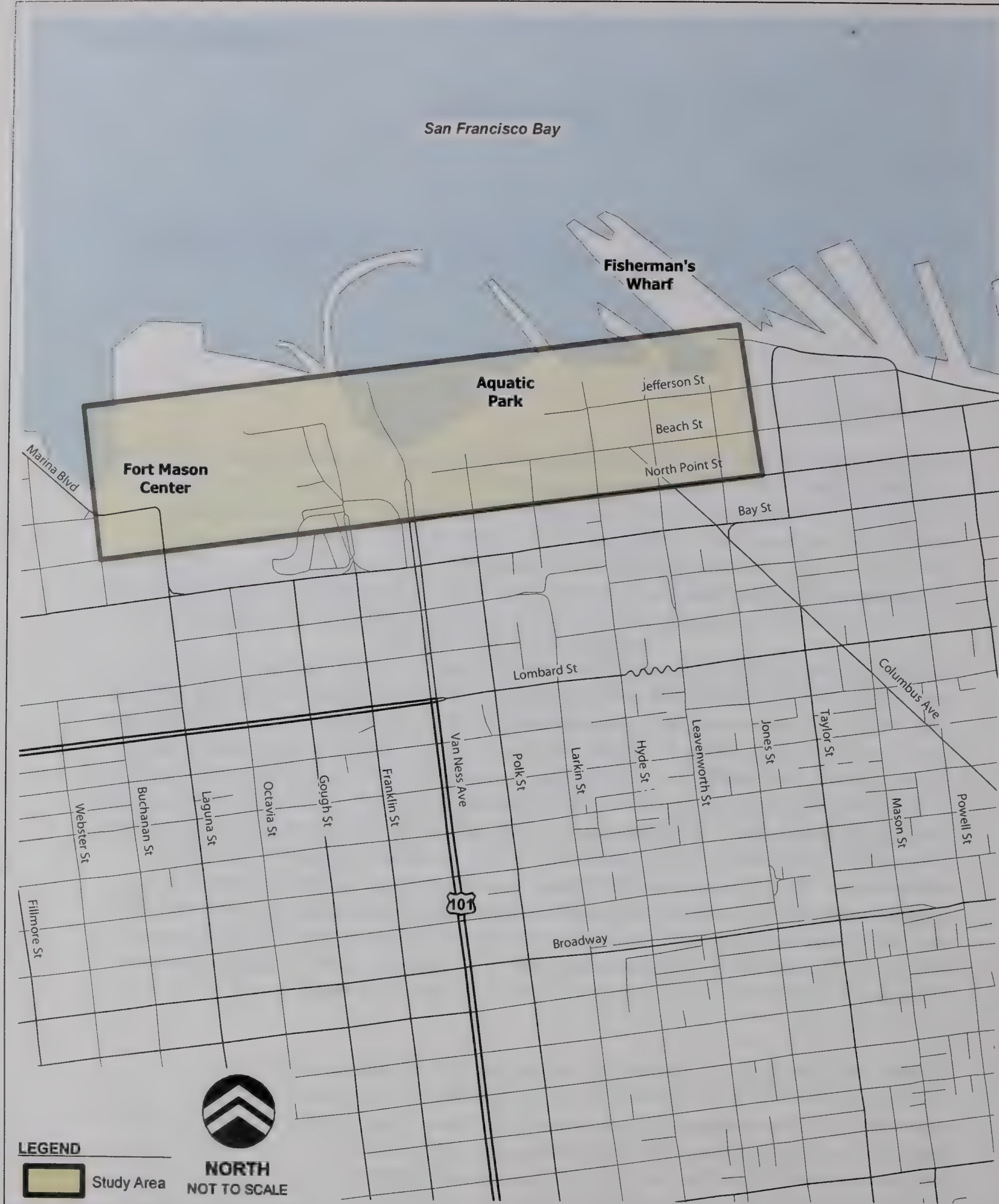
3.4.2 Environmental Setting

Transit Operations

Regional transit service between San Francisco and the North Bay is provided by Golden Gate Transit (bus and ferry lines); between San Francisco and the East Bay by Alameda-Contra Costa Transit (AC Transit), Bay Area Rapid Transit (BART), and ferry lines; and between San Francisco and the South Bay by San Mateo County Transit (SamTrans), BART, and Caltrain. Local transit service is provided by the San Francisco Municipal Railway (Muni), which operates a network of over 80 transit lines throughout San Francisco, including local, limited and express stop services. Transit services within the transportation and circulation study area and in the project vicinity are shown on **Figure 3.4-2**.

Muni: Within the transportation and circulation study area and in the project vicinity, Muni operates several bus routes, the Powell-Hyde and Powell-Mason cable cars, and the F-Line historic streetcar. The 19-Polk line operates on Polk Street, terminating at Ghirardelli Square with a counter-clockwise loop from Polk Street to Larkin Street, Beach Street and Polk Street. The 30-Stockton, 30X-Marina Express, 47-Van Ness and 49-Van Ness-Mission lines run through the transportation and circulation study area on Van Ness Avenue and/or North Point Street. The 28-19th Avenue line provides service to the Fort Mason area along Laguna Street in the eastbound/southbound direction. The F-Line historic streetcar travels westbound on Jefferson Street, and turns southbound at Jones Street where it terminates; the "return" service travels eastbound along Beach Street. The Powell-Hyde cable car operates north-south along Hyde Street, and has one turntable on the north-west corner of the Hyde and Beach Streets intersection. The Powell-Mason cable car operates on Mason Street, Columbus Avenue, and Taylor Street before terminating at Bay Street. In addition, the 22-Fillmore line stops at Fillmore and Beach Streets, a walk of about 0.3 mile to the Marina Boulevard / Laguna Street intersection.

Golden Gate Transit (GGT): The Golden Gate Bridge, Highway and Transportation District, provides bus service between the North Bay (Marin and Sonoma Counties) and San Francisco. In the transportation and circulation study area, Golden Gate Transit's buses operate only during weekday peak hour in the peak-direction; the service times are generally 6:00 to 9:00 a.m. and 4:00 to 7:00 p.m. Only morning buses, which traverse Beach Street eastbound, will be affected directly by this Project; the afternoon commute buses travel westbound on North Point Street. There are 16 GGT bus lines transiting along Beach Street. The morning commute bus services enter the transportation and circulation study area northbound on Polk Street, turn eastbound onto Beach Street, and then continue onto The Embarcadero making a passenger stop at Hyde Street (far side).



Source: Wibur Smith Associates

TRANSPORTATION AND CIRCULATION STUDY AREA

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 3.4-1

Source: Wibur Smith Associates

TRANSIT MAP

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Historic Streetcar Extension
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FIGURE 3.4-2

BART: BART operates heavy rail passenger service in the San Francisco Bay Area. BART currently operates five lines: Pittsburg/Bay Point to San Francisco International Airport, Fremont to Daly City, Richmond to Daly City/Millbrae, Fremont to Richmond, and Dublin/Pleasanton to Daly City/Millbrae. In San Francisco, BART operates underground along Market and Mission Streets. In general, BART operates at 15-minute headways per line on weekdays between 5:00 a.m. and 7:00 or 8:00 p.m. During weekday peak hours, the Pittsburg/Bay Point to San Francisco International Airport line operates frequently at 5- to 6-minute headways. During evening and weekend hours, trains generally operate at 20-minute headways per line. The BART station closest to the Project site is the Embarcadero Station, with a nearby connection to the Muni F-line to reach the Project area.

AC Transit: AC Transit is the primary bus operator for the East Bay, including Alameda and western Contra Costa Counties. AC Transit operates 32 routes between the East Bay and San Francisco, terminating at the Transbay Terminal located on Mission Street between Fremont and 1st Streets. Most Transbay service is peak-hour and peak-direction, traveling to San Francisco during the a.m. peak period (generally 6:00 to 9:00 a.m.) and from San Francisco during the p.m. peak period (generally 3:00 to 6:00 p.m.), with 15- to 30-minute headways per route. Four routes operate throughout the day on weekdays (with 30- to 45-minute headways per route), and two routes operate on weekends (with 30- to 60-minute headways per route). From the vicinity of the Transbay Terminal, the Muni F-line provides service to the Project area.

SamTrans: SamTrans is the primary public transit operator for San Mateo County. In addition, SamTrans provides service between San Mateo County and San Francisco. SamTrans operates 14 bus routes that serve San Francisco, including 12 routes into the downtown area (ending at the Transbay Terminal). Three of the downtown San Francisco routes provide service on a weekday daily and weekend basis (with 30-minute headways per route). From the vicinity of the Transbay Terminal, the Muni F-line provides service to the Project area.

Ferries: Ferry service is available between San Francisco, North Bay and East Bay communities, and tourist destinations from a variety of service providers. Ferry terminals are found at the Ferry Building (located on The Embarcadero at the foot of Market Street outside the study area) and at Fisherman's Wharf (located within the transportation and circulation study area). Ferry service is oriented towards both commuter and recreational traffic, with the majority of ferry service at Fisherman's Wharf oriented towards recreational and tourist patrons. Ferry service includes:

Ferry Operator	Destination
Ferry Terminal	
Golden Gate Transit	Sausalito, Larkspur
Alameda/Oakland Ferry	Alameda, Oakland
Alameda Harbor Bay Ferry	Harbor Bay Isle
Blue & Gold Fleet	Angel Island, Tiburon
Baylink	Vallejo
Fishermans Wharf	
Alameda/Oakland Ferry	Alameda, Oakland, Angel Island from Pier 41
Blue & Gold Fleet	Angel Island, Sausalito, Tiburon from Pier 41 Sightseeing tours from Pier 39

Ferry Operator	Destination
Baylink	Vallejo
Alcatraz Cruises, LLC aboard the Hornblower Fleet	Alcatraz Island tours from Pier 31½ / 33
Adventure Cat	Sightseeing tours from Piers 39
Red and White Fleet	Sightseeing tours from Piers 43½

Caltrain commuter rail service is managed by the Peninsula Corridor Joint Powers Board (PCJPB) and operated by Amtrak under contract to the PCJPB. Caltrain runs along the San Francisco Peninsula and Santa Clara Valley. The northern terminal of the rail line is in San Francisco, at 4th and King Streets, while the southern terminal is located in Gilroy. Trains operate out of San Francisco and San Jose on a half-hourly basis every weekday, with more frequent service provided during commute hours (5:30-8:30 a.m. and 5:00-8:00 p.m.). Service between San Jose and Gilroy is limited to three daily commute-hour round trips. During weekend and holidays, trains operate at hourly frequencies.

General Traffic Conditions

Existing intersection operating conditions were evaluated for the weekday p.m. peak hour (generally occurring between 4:00 and 6:00 p.m.) and weekend midday peak hour (generally between 12:00 Noon and 2:30 p.m.) at eight intersections in the transportation and circulation study area (see **Figure 3.4-3**). Turning movement volume counts were conducted on Wednesday, January 16, 2008 and Saturday, February 16, 2008 for the weekday and weekend scenario, respectively. See **Figure 3.4-4** for lane configurations and **Figure 3.4-5** for peak-hour traffic volumes (raw count data are presented in **Appendix B**).

Due to the tourist-oriented nature of the land uses in the Project area, it was judged that conducting traffic volume counts in January-February would not represent typical conditions during the tourist season, which typically occurs in the spring and summer months, and further analyses was undertaken to develop a set of turning movement volumes that represent typical summer traffic conditions in the Project area. To achieve representative summer volumes, pedestrian and vehicular counts were also conducted at The Embarcadero and Bay Street intersection; the results were compared to traffic counts performed at the same intersection in June 2007.

The analysis of the Bay Street intersection indicated that traffic in the area on a good weather day in late January or early February represents approximately 80 percent of the traffic volumes that can be expected on a typical summer day. As a result, a 1.22 for the weekday and 1.24 for the weekend seasonality factor was applied to all turning movement and pedestrian counts collected as part of this study, in order to establish base conditions for the peak tourist season.

The operations of intersections are commonly measured and described using a grading system called Level of Service (LOS), which qualitatively characterizes traffic conditions associated with varying levels of vehicle traffic, based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined, ranging from LOS A (indicating free-flow traffic conditions with little or no delay experienced by motorists) to LOS F (indicating congested conditions where traffic flows exceed design capacity and result in long delays). This LOS grading system applies to both signalized and

Source: Wibur Smith Associates

PROJECT STUDY INTERSECTIONS

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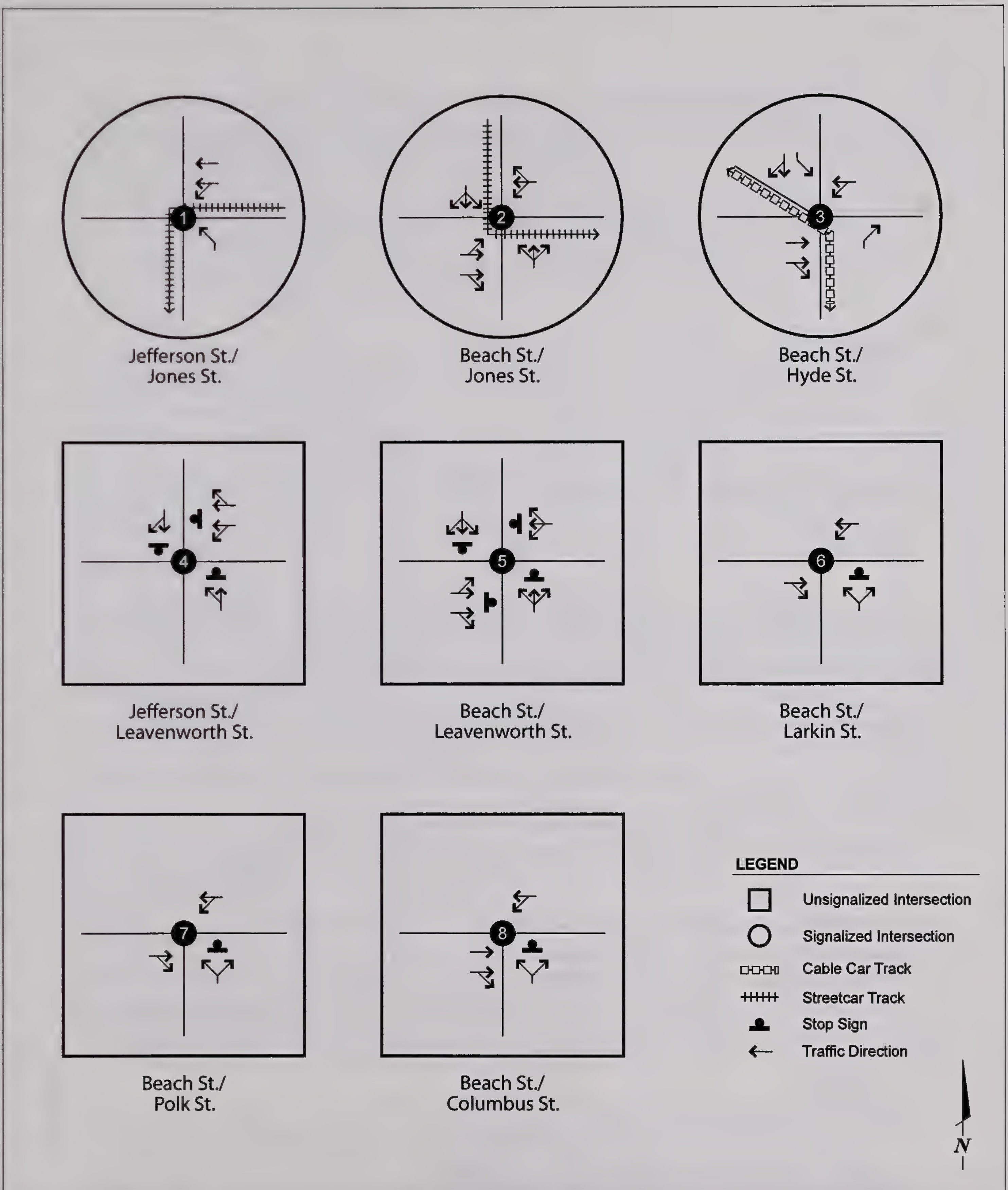
FIGURE 3.4-3



Source: Wibur Smith Associates

EXISTING LANE CONFIGURATIONS

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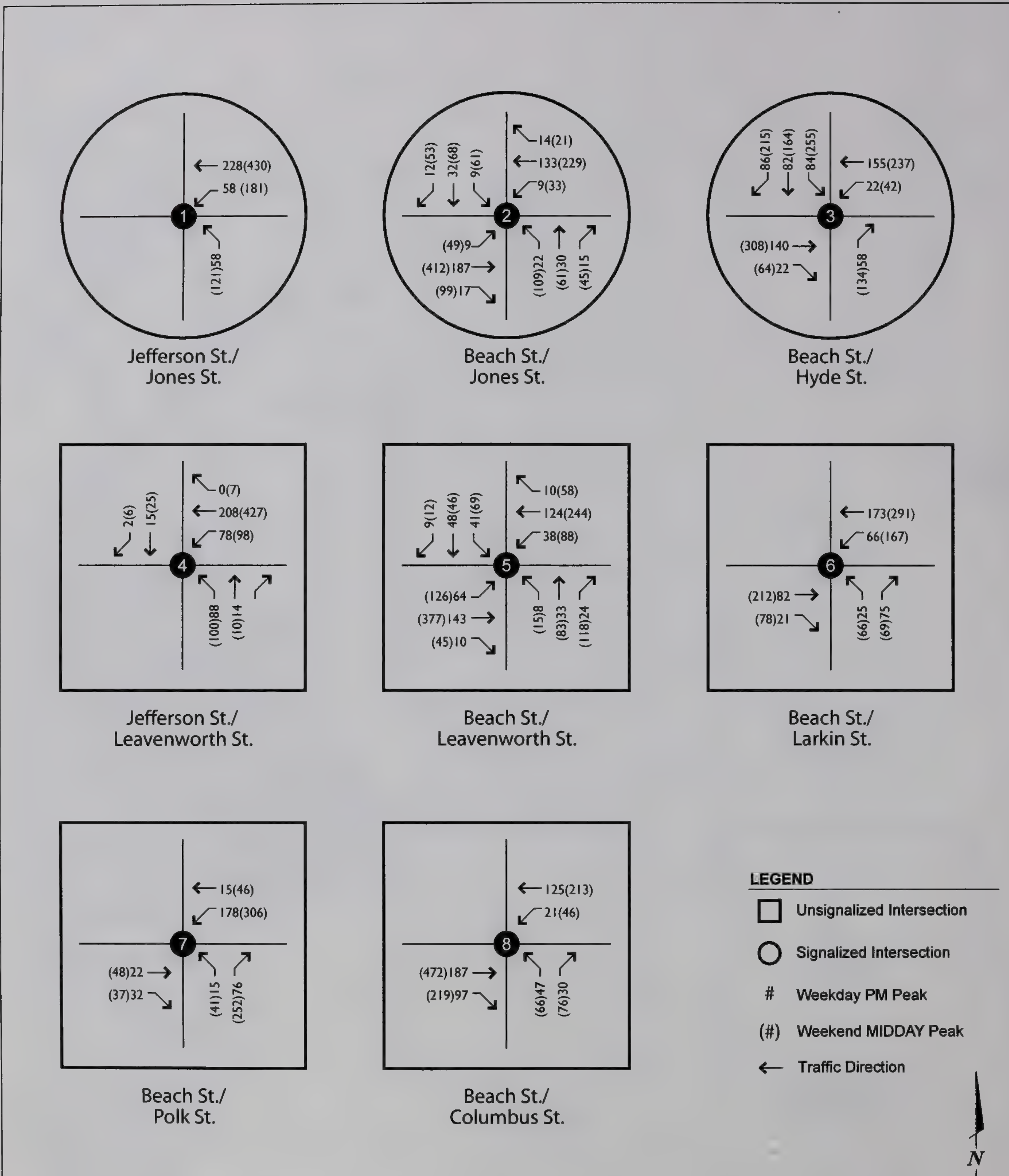
FIGURE 3.4-4



Source: Counts conducted by WSA on Wednesday 1/16/2008 and Saturday 2/16/2008

Source: Wibur Smith Associates

EXISTING WEEKDAY PM PEAK & MIDDAY WEEKEND PEAK HOUR TRAFFIC VOLUMES

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FIGURE 3.4-5

unsignalized intersections. The City of San Francisco has established LOS D as the generally acceptable service level standard. **Table 3.4-1** presents definitions of LOS and average delay for signalized and unsignalized intersections.

The Synchro traffic analysis software program was used to determine the LOS of the study intersections, using the *2000 Highway Capacity Manual* methodologies (Transportation Research Board 2000). and show the results of the analysis for the existing Weekday p.m. Peak and Weekend Midday Peak scenario, respectively. The full Synchro report is included in .

With respect to weekday conditions, all of the study intersections operate at an acceptable LOS. The LOS ranges between A and B, with the exception of the intersection at Jefferson and Jones Streets, which operates at LOS C. Weekend conditions also have acceptable LOS, with no intersection operating worse than LOS C. However, the worsening of LOS, when compared to weekday conditions, is noticeable. All intersections experience a drop of one (intersection 2, 3, 4, 7, 8) or two (intersection 5 and 6) LOS levels, with the exception of the Jefferson and Jones Streets, which remains at LOS C.

Parking

Parking resources in the transportation and circulation study area and project vicinity include both on-street and off-street facilities. **Table 3.4-4** shows existing on-street parking for the streets on which streetcars currently operate or might possibly operate in the future. In general, there are very few on-street parking spaces available during peak hours; the occupancy rate is approximately 90 to 100 percent for all streets within the transportation and circulation study area. **Table 3.4-5** provides a survey of the major off-street public parking facilities within or in proximity to the transportation and circulation study area. The table includes hotels that allow public parking.

In addition, there are parking spaces on Van Ness Avenue (within the San Francisco Maritime Historical Park) near, but not within, the Transition Segment of the Project. These parking spaces would not be affected by the Project.

The area of parking potentially affected by the Project extends west of Fort Mason Center to Fillmore Street, north of Bay Street. While this western area would not see streetcar service operating on its streets, it could experience parking impacts associated with the Project. It is not uncommon for commuters and others to park and walk that distance to board transit. However, as described below, much of the parking available in this area is restricted by meters or residential permits and so would not be suitable for long-term parking required by commuters.

The on-street parking is controlled by the city's residential permit parking program (Area M), which limits parking on weekdays to two hours for those without permits (available only to residents of Area M) between 8:00 am and 6:00 pm. At noontime on weekdays, the on-street spaces are about 70 percent used, and at noontime on weekends, the spaces are typically 95 to 100 percent occupied.[1]

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[1] Wilbur Smith Associates – *Fort Mason Center Parking Monitoring Study*, July 2007.

TABLE 3.4-1: DEFINITIONS FOR INTERSECTION LEVEL OF SERVICE

Unsignalized Intersections		Level of Service Grade	Signalized Intersections	
Description	Average Total Vehicle Delay (Seconds)		Average Control Vehicle Delay (Seconds)	Description
No delay for stop-controlled approaches.	≤10.0	A	≤10.0	Free Flow or Insignificant Delays: Operations with very low delay, when signal progression is extremely favorable and most vehicles arrive during the green light phase. Most vehicles do not stop at all.
Operations with minor delay.	>10.0 and ≤15.0	B	>10.0 and ≤20.0	Stable Operation or Minimal Delays: Generally occurs with good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average delay. An occasional approach phase is fully utilized.
Operations with moderate delays.	>15.0 and ≤25.0	C	>20.0 and ≤35.0	Stable Operation or Acceptable Delays: Higher delays resulting from fair signal progression and/or longer cycle lengths. Drivers begin having to wait through more than one red light. Most drivers feel somewhat restricted.
Operations with increasingly unacceptable delays.	>25.0 and ≤35.0	D	>35.0 and ≤55.0	Approaching Unstable or Tolerable Delays: Influence of congestion becomes more noticeable. Longer delays result from unfavorable signal progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop. Drivers may have to wait through more than one red light. Queues may develop, but dissipate rapidly, without excessive delays.
Operations with high delays, and long queues.	>35.0 and ≤50.0	E	>55.0 and ≤80.0	Unstable Operation or Significant Delays: Considered to be the limit of acceptable delay. High delays indicate poor signal progression, long cycle lengths and high volume to capacity ratios. Individual cycle failures are frequent occurrences. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
Operations with extreme congestion, and with very high delays and long queues unacceptable to most drivers.	>50.0	F	>80.0	Forced Flow or Excessive Delays: Occurs with oversaturation when flows exceed the intersection capacity. Represents jammed conditions. Many cycle failures. Queues may block upstream intersections.

SOURCE: Transportation Research Board, Highway Capacity Manual, 2000.

TABLE 3.4-2: EXISTING WEEKDAY P.M. PEAK-HOUR LEVEL OF SERVICE (LOS) AND AVERAGE DELAY

Intersection	Traffic Control[a]	LOS	Delay[b]
1. Jefferson Street and Jones Street	Signal	C	20.2
2. Beach Street and Jones Street	Signal	B	13.1
3. Beach Street and Hyde Street	Signal	B	12.1
4. Jefferson Street and Leavenworth Street	AWSC	A	8.4
5. Beach Street and Leavenworth Street	AWSC	A	8.8
6. Beach Street and Larkin Street	SSSC[c]	A	8.7
7. Beach Street and Polk Street	SSSC[c]	A	8.3
8. Beach Street and Columbus Avenue	SSSC[c]	A	8.1

[a] AWSC is an unsignalized intersection with All-Way Stop-Control, and SSSC is an unsignalized intersection with Side-Street Stop-Control.

[b] The LOS and delay represent conditions for the overall intersection.

[c] This intersection was analyzed as AWSC because, from field observations, it was noted that most of the vehicles on the major (uncontrolled) street come to a full stop due to high pedestrian crossing volumes.

SOURCE: Wilbur Smith Associates (based on traffic counts conducted on Wednesday, January 16, 2008)

TABLE 3.4-3: EXISTING WEEKEND MIDDAY PEAK-HOUR LEVEL OF SERVICE (LOS) AND AVERAGE DELAY

Intersection	Traffic Control[a]	LOS	Delay[b]
1. Jefferson Street and Jones Street	Signal	C	23.0
2. Beach Street and Jones Street	Signal	C	25.1
3. Beach Street and Hyde Street	Signal	C	20.1
4. Jefferson Street and Leavenworth Street	AWSC	B	10.3
5. Beach Street and Leavenworth Street	AWSC	C	19.3
6. Beach Street and Larkin Street	SSSC[c]	C	16.4
7. Beach Street and Polk Street	SSSC[c]	B	12.0
8. Beach Street and Columbus Avenue	SSSC[c]	B	12.1

[a] AWSC is an unsignalized intersection with All-Way Stop-Control, and SSSC is an unsignalized intersection with Side-Street Stop-Control.

[b] The LOS and delay represent conditions for the overall intersection.

[c] This intersection was analyzed as AWSC because, from field observations, it was noted that most of the vehicles on the major (uncontrolled) street come to a full stop due to high pedestrian crossing volumes.

SOURCE: Wilbur Smith Associates (based on traffic counts conducted on Saturday, February 16, 2008)

TABLE 3.4-4: ON-STREET PARKING SURVEY[a]

Roadway	From	To	Meter	Yellow	White	Blue	Transit	Other
Jefferson	Jones	Leavenworth	9		2			
	Leavenworth	Jones	14					
Jones	Jefferson	Beach					F-Line	
	Beach	Jefferson						9
Leavenworth	Jefferson	Beach	3	8				
	Beach	Jefferson	2	3	4	1		
Beach	Jones	Leavenworth	3	6	4	1		
	Leavenworth	Hyde	7		3	1		
	Hyde	Polk	25		4	3	Muni	23
	Polk	End Street						24
	End Street	Polk						10
	Polk	Larkin	12	1	4			
	Larkin	Hyde	16	2				
	Hyde	Columbus		4	3		Golden Gate	
	Columbus	Leavenworth			2			
	Leavenworth	Jones		14				

[a] Meter = normal meter parking; Yellow = short-term parking for commercial vehicle loading/unloading; White = short-term parking for passenger loading/unloading; Blue = parking for handicapped drivers; Transit = bus, cable car or streetcar stop present; and Other = either free unregulated space or special parking schedule.

SOURCE: Wilbur Smith Associates, December 2007 (WSA 2007c)

TABLE 3.4-5: OFF-STREET PARKING SURVEY

Parking Garage / Lot	Supply
Pier 45 Shed A	200
Pier 43 ½	102
Fisherman's Wharf Triangle Lot	273
Mason Street / Jefferson Street Lot	40
Anchorage Garage	587
Wharf Parking Inc.	150
Taylor Street / Beach Street *Park and Lock*	40
The Wharf Garage	250
Radisson	235
Pier 39 Parking Garage	978

TABLE 3.4-5: OFF-STREET PARKING SURVEY (CONTINUED)

Parking Garage / Lot	Supply
Ghirardelli Square	275
655 Beach Street	119
Holiday Inn Fisherman's Wharf	210
Nunzio's Public Parking	24
Longshoreman's Union Hall	50
Sheraton Fisherman's Wharf	230
Academy of Art University	140
SOURCE: San Francisco Municipal Transportation Agency, *Existing Transportation Conditions Report for the Fisherman's Wharf Area Plan*, August 2003	

With respect to off-street parking, the Fort Mason Center lot is the only one directly affected by the Project; currently there are 446 spaces, of which 20 spaces are for disabled parking, 4 spaces are reserved for National Park Service permit holders, and the rest require a parking fee (except for the first 30 minutes, when parking is free). The occupancy rate of the Fort Mason Center parking facility is generally low during weekday (peaking at about 33 percent during midday) and mid-high during weekends (highest peak is about 68 percent during midday and evening). This lot is also used by large semi-trucks for staging and loading purposes. One observation found ten large trucks staging on the parking lot. **Table 3.4-6** provides more detailed off-street parking occupancy data.

TABLE 3.4-6: FORT MASON CENTER PARKING SURVEY AND OCCUPANCY

Day of Week	Supply	Morning Occupancy (Percent)	Midday Occupancy (Percent)	Evening Occupancy (Percent)
Weekday	446	124 (28%)	145 (33%)	123 (28%)
Weekend	446	152 (34%)	306 (68%)	300 (67%)
SOURCE: Wilbur Smith Associates, *Fort Mason Center Parking Monitoring Study*, July 2007 (WSA 2007a)				

In addition to the Fort Mason Center lot, off-street parking is available in lots immediately surrounding the Fort Mason Center related to the marina (the East Harbor [also known as Gashouse Cove], Marina Green and Upper Fort Mason) and the Safeway store. Occupancy of the marina lots (about 800 spaces) is greatest on weekdays during the midday (57 percent), with a weekend midday peak of 74 percent during special events at the Fort Mason Center. The Safeway parking lot (about 170 spaces - typically about two-thirds occupied at Noon on weekdays and weekends, and full during evening hours) is a private parking facility, and is described here only because of the potential for unauthorized use by visitors to Fort Mason Center.

Bicyclists and Pedestrians

The Project site is located in the proximity of several of San Francisco's tourist attractions, including Fort Mason Center, Ghirardelli Square, Aquatic Park, the Anchorage shopping center and Fisherman's Wharf. Pedestrian activity levels are generally light in the morning, and increase following the opening of tourist attractions between 9:00 and 10:00 a.m. The highest volume of pedestrians are along Jefferson Street; crossing locations at Leavenworth and Jones Streets experience an average of 1,500 or more pedestrians per hour during weekdays and up to 5,000 pedestrians during the weekend peak hours (Wilbur Smith Associates 2008 – See Appendix B). Sidewalks are in good condition and range from 10 to 16 feet wide; however, there are several locations where the sidewalk capacity is reduced by street vendors and artists' stands (e.g., on the north side of Beach Street between Larkin and Hyde Streets), outdoor restaurant seating (e.g., along the north side of Jefferson Street, between Leavenworth and Jones Streets), utility poles, and street furniture. This is especially true on Jefferson Street where pedestrian volumes are high. Crosswalks are striped for each roadway of the study intersections.

The Bay Trail (under the jurisdiction of the Association of Bay Area Governments) traverses the Project site with an alignment that connects with The Embarcadero on the east side to the Marina Green on the west side via Jefferson Street, the Aquatic Park promenade north of the Maritime Museum, a connecting trail in Upper Fort Mason, the eastern sidewalk along Laguna Street (crossing the Main Gate to Fort Mason Center), and continuing along the northern edge of Marina Boulevard. The Bay Trail is intended to complement, rather than supplant, local regulations and guidelines.

The following four designated bikeways, as well as a segment of the San Francisco Bay Trail are in the project area (see **Figure 3.4-6**):

- Bicycle Route 2 connects The Embarcadero to the Golden Gate Bridge through the transportation and circulation study area along North Point Street to Van Ness Avenue. Route 2 continues north on Van Ness Avenue where it follows the pathway along the north edge of Fort Mason. From Fort Mason, Route 2 continues on Marina Boulevard west to the Presidio. Portions of Route 2 through Fort Mason and along the Marina Green are Class I off-road shared pedestrian/bicycle pathways, while the on-street segments on North Point Street, Van Ness Avenue, and Marina Boulevard are Class III bicycle routes (wherein bicyclists and autos share the pavement width).
- Bicycle Route 4 connects Polk Street to the Golden Gate Bridge. In the vicinity of the transportation and circulation study area, Route 4 travels along Francisco Street from Polk Street to Laguna Street and then along Bay Street to Fillmore Street, continuing to the Presidio and the Golden Gate Bridge. The segments on Bay Street west of Laguna Street and Francisco Street in the eastbound direction have Class II bicycle lanes (wherein a striped lane is provided for bicyclists, separate from autos). Other segments are Class III bicycle routes.
- Bicycle Route 11 connects Fisherman's Wharf to AT&T Park (the Giants baseball ball park at 3rd and King Streets). In the vicinity of the transportation and circulation study area, Route 11 is located on Columbus Avenue, terminating at North Point Street with Class III bicycle routes.
- Bicycle Route 25 connects Aquatic Park to Visitation Valley. Within the transportation and circulation study area, Route 25 is located on Polk Street, terminating at Beach Street with a Class II bicycle lane in the southbound direction and a Class III bicycle route in the

Source: Wibur Smith Associates

BICYCLE FACILITIES

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FIGURE 3.4-6

northbound direction between Beach and Lombard Streets. Polk Street south of Lombard Street has Class II bicycle lanes in both directions.

- A segment of the San Francisco Bay Trail runs along the waterfront from the Embarcadero on Jefferson Street to connect with Class I bicycle path on the above-described Route 2 through the Golden Gate National Recreation Area, Aquatic Park and the Fort Mason Center. Past Fort Mason Center, the Bay Trail continues on the north side of Marina Boulevard to Fort Point and the Golden Gate Bridge.

The transportation and circulation study area has very active bicycle use by locals and tourists. In fact, there are five bicycle shops in the transportation and circulation study area and two in proximity that only rent bicycles (i.e., no sell/repair). While there are some designated bikeways in the transportation and circulation study area, bicyclists can be found on all streets particularly on Beach and Jefferson Streets.

3.4.3 Regulations and Policies

The following federal, state and local regulations govern the review and analysis of transportation in the study area.

Federal Guidelines

National Environmental Policy Act of 1969 (NEPA). Requires all federal agencies to assess the environmental impacts of proposed projects and disclose the impacts of the project to the public in order promote efforts that will prevent or eliminate damage to the environment. The President's Council on Environmental Quality (CEQ) was established to oversee NEPA for all federal agencies. The National Park Service (NPS) is the lead NEPA agency for this project.

United States Department of Transportation (USDOT) Act of 1966 - Section 4(f). Section 4(f) provides protection to certain publicly used lands and historic sites. Under Section 4(f), the USDOT shall not approve a program or project that requires the use of any publicly-owned public park, recreation area or wildlife or waterfowl refuge, or a site of any land from an historic site or national, state, or local significant unless:

- There is no feasible and prudent alternative to the use, and
- All possible planning to minimize harm resulting from such use is included.

The Golden Gate National Recreational Area General Management Plan (GMP) (1980). Golden Gate National Recreation Area (GGNRA) was established in 1972. In 1977 the GGNRA Travel Study, mandated by Congress, recommended restoration of the historic rail link between the Hyde Street Pier, Aquatic Park, and lower Fort Mason to improve access to the national park. The study's Joint Control Board included representatives from the San Francisco Metropolitan Transportation Commission, the City and County of San Francisco, the Federal Highway Administration, the California Department of Transportation (Caltrans), and others. The study identified restoration of the historic rail service as an important method to reduce congestion and visitor use of private

passenger vehicles to access the park. The restoration of rail service along the city's northern waterfront using the historic rail corridor was also a recommendation of the 1980 GMP for GGNRA.

The GGNRA GMP, which was implemented in 1980, is the master plan document for the entire GGNRA. The document describes the existing character and setting of the GGNRA and sets forth goals for future development within the park. The document is made up of two parts: The GMP, which guides development policy within the park; and The Environmental Analysis, which describes the environmental impacts The GMP may incur if implemented. Within the Transportation section of The GMP, under "Immediate Considerations" it states: "*Better scheduling and direct routing of weekend public transit to the park (in many cases simply extending an existing bus route three to five blocks) will greatly improve the probability of greater reliance on transit for park access.*" The text goes on to recommend the following transportation improvement to achieve this goal: *"Improved service connecting southeast San Francisco neighborhoods and San Francisco parklands."* Further, The GMP suggests *"A shuttle connecting parklands along the northern San Francisco waterfront utilizing the beltline railroad right-of-way. This shuttle, which may utilize historic San Francisco trolley cars, will travel along the existing railroad tracks from Aquatic Park to Crissy Field and may be extended as far as Fort Point..."* The current GGNRA GMP is in the process of being updated and is expected to be implemented in August 2012.[2]

The San Francisco Maritime National Historical Park (SF Maritime NHP) General Management Plan (1997). The SF Maritime NHP GMP which was completed in 1997, is the master plan document for SF Maritime NHP. The document describes the existing character and setting of SF Maritime NHP and sets forth goals for future development within the park. The document is made up of two parts: The Plan; which guides development policy within the park, and The Environmental Analysis; which describes the environmental impacts The GMP may incur if implemented.

Within the Visitor Use and Development section of the GMP, under "Access and Circulation" it states: "The park and Fisherman's Wharf area in general are highly accessible by various forms of mass transit (MUNI transit lines/cable car and F line). *The park will work cooperatively with the City of San Francisco and local business interests to encourage local residents and visitors to use their alternative forms of transportation." The text goes on to state "To improve access the park will support the Golden Gate National Recreation Area General Management Plan and the Presidio General Management Plan Amendment. These include opening the railroad tunnel under Fort Mason as an access to the maritime park from the Marina District and Presidio and extending the F-line rail system from Fisherman's Wharf west through Aquatic Park to the Presidio and establishing a system of water shuttles accessing park sites in San Francisco Bay.*"

2006 National Park Service Management Policies

9.1.1.2 Integration of Facilities into Park Environment. The integration of facilities into the park environment will involve: assessment of the transportation and mobility needs of park visitors and concessioner and NPS employees, and of access to the park from gateway communities.

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[2] Plan Process, Step 6, http://parkplanning.nps.gov/PlanProcess.cfm?parkId=&projectId=15075, Accessed July 2, 2007.

9.2 Transportation Systems and Alternative Transportation. The location, type, and design of transportation systems and their components (e.g., roads, bridges, trails, and parking areas), and the use of alternative transportation systems, all strongly influence the quality of the visitor experience. These systems also affect, to a great degree, how and where park resources will be impacted. For these reasons, management decisions regarding transportation facilities require a full, interdisciplinary consideration of alternatives and a full understanding of their consequences. Traditional practices of building wider roads and larger parking areas to accommodate more motor vehicles are not necessarily the answer. The Service must find transportation solutions that will preserve the natural and cultural resources in its care while providing a high-quality visitor experience.

Federal Transit Administration New Starts Program. The Federal Transit Administration (FTA) provides capital funding for projects like the Fort Mason Center Historic Streetcar Extension under their New Starts Program. Projects with total costs under $250 million, and requesting less than $75 million of federal funding, are eligible for a less rigorous application process, "Small Starts". FTA funding is not envisioned to fund the extension.

State and Regional Guidelines

San Francisco Bay Plan (2003). The San Francisco Bay Conservation and Development Commission (BCDC) is a state agency with the authority to issue or deny permit applications for placing fill, extracting minerals, or changing the use of any land, water, or structure within the San Francisco Bay. The plan area's jurisdiction is defined as the San Francisco Bay, a band of land 100 feet (30 meters) from the shoreline of the San Francisco Bay, saltponds, managed wetlands and certain specified waterways. The San Francisco Bay Plan, adopted in 1968 by BCDC and last amended in 2006, includes policies to guide future uses of the Bay and shoreline and includes a set of maps which show where the policies should apply to the present Bay and shoreline.[3] The project alternative which proposes a portion of the railway to travel along the Aquatic Park promenade is within the jurisdiction of the San Francisco Bay Plan. According to the BCDC, *nearly all work, including grading, on land within 100 feet of the Bay shoreline needs permit approval.* With regards to federal projects, the Coastal Zone Management Act allows the Commission to review federal projects and projects that require federal approval or federal funding; a process known as "federal consistency". However, the Commission cannot require federal agencies to submit permit applications and cannot impose conditions on in its federal consistency decisions. Nevertheless, the federal agencies and applicants for federal approvals must provide the project's details and data to assure that the Commission has the information it needs to evaluate the project (BCDC 2007). The following policies from the Bay Plan are applicable to the project study area.

- **Policy 1** – Because of the continuing vulnerability of the Bay to filling for transportation projects, the Commission should continue to take an active role in Bay Area regional transportation and related land use planning affecting the Bay, particularly to encourage alternative methods of transportation and land use planning efforts that support transit and that do not require fill. The Metropolitan Transportation Commission, the California Department of Transportation, the California Transportation Commission, the Federal Highway Administration, county congestion management agencies and other public and

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[3] San Francisco Bay Plan, Adopted 2003.

private transportation authorities should avoid planning or funding roads that would require fill in the Bay and certain waterways.

- **Policy 4** – Transportation projects on the Bay shoreline and bridges over the Bay or certain waterways should include pedestrian and bicycle paths that will either be a part of the Bay Trail or connect the Bay Trail with other regional and community trails. Transportation projects should be designed to maintain and enhance visual and physical access to the Bay and along the Bay shoreline.

California Public Utility Commission (CPUC). The CPUC regulates rail operations on streets and highways in California. While the CPUC does not have jurisdiction over projects on National Park Service property, it does have jurisdiction over the sections of the extension that are not on federal property. As such it will need to approve the street traffic integration plan including traffic control devices, vehicles, and operating practices and, therefore, is a key partner for this project. The Manual of Uniform Traffic Control Devices allows for STOP sign control crossings for low volume traffic crossings that like proposed by the Fort Mason Center Historic Streetcar Extension project at Van Ness Avenue. While the regulations are silent regarding rail integration into parking lots (Fort Mason Center), the CPUC mostly likely will want to weigh in on the design and operational safety.

Port of San Francisco. The Port is responsible for some of the on-street parking in the study area. Removal of their on-street parking would require Port approvals.

Local Guidelines

This section describes various elements of the City and County of San Francisco's General Plan, as well as Specific Area Plans that contain adopted transportation polices applicable to the project study area. The General Plan elements reviewed include the Transportation Element. The Area Plans reviewed include Northeastern Waterfront, Van Ness Avenue, the Waterfront Land Use Plan by the Port of San Francisco, San Francisco Waterfront Special Area Plan, and the San Francisco Bicycle Plan.

City and County of San Francisco General Plan (2007) – Transportation Element. The Transportation Element of the General Plan of the City and County of San Francisco was first adopted in 1972 and was later amended by the Board of Supervisors in 2007. The Transportation Element is composed of nine sections: general; regional transportation, congestion management; vehicle circulation; transit; pedestrians; bicycles; citywide parking; and goods movement. Policy 1.3 is to "*give priority to public transit and other alternatives to the private automobile as the means of meeting San Francisco's transportation needs, particularly for commuters.*" Policy 1.6 is for mass transit to be given priority for trips where travel demands exceeds the capacity of the area to absorb more vehicular traffic without substantial environmental damage or where further capacity for automobiles movement or storage is very costly. Policy 1.6 also is to give priority to mass transit for trips to major recreational areas and to sports, cultural and other heavily attended events. Policy 4.4 is to integrate future rail extensions to, from and within the city so that they are compatible with and immediately accessible to existing BART, Caltrain or MUNI rail lines. Finally, Policy 21.3 is to "*make future rail transit extensions in the city compatible with existing BART, Caltrain or MUNI rail lines. In order to ensure potential linkage, interchange of vehicles and cost savings, new rail transit lines should be of the same basic type as either the BART, Caltrain or MUNI systems, depending on the potential link.*"

Northeastern Waterfront Area Plan (1998). The Northeastern Waterfront Area Plan is an area plan of the General Plan of the City and County of San Francisco. It was first adopted in 1977 and later amended by the Board of Supervisors 1998. The Northeastern Waterfront Area Plan recommends "*objectives and policies designed to contribute to the waterfront's environmental quality, enhance the economic vitality of the Port and the City, preserve the unique maritime character, and provide for the maximum feasible visual and physical access to and along the Bay.*"[4] The Plan recommends "*general objectives and policies for Land Use, Transportation, and Urban Design and recommends specific objectives and policies which apply to four geographic subareas as well as the Embarcadero Corridor which links them: Fisherman's Wharf Subarea (which extends from the Municipal Pier at Van Ness Avenue through Pier 39); the Base of Telegraph Hill Subarea (Pier 35 through Pier 7); the Ferry Building Subarea (Pier 5 through Rincon Park); and the South Beach Subarea (Pier 22 through Pier 46B).*"[5] The following policies are applicable to the project study area.

- **Policy 7.3** – Connect the recreation and open space facilities of the Northeastern Waterfront with those of the Golden Gate National Recreation Area.[6]
- **Policy 9.5** – Improve transit service to, and along, the Northeastern Waterfront. Provide a connection between the F-line and the MUNI Metro Extension to allow for continuous transit rail service in an exclusive right-of-way along The Embarcadero between Fisherman's Wharf and China Basin, which also connects with or provides easy transfers to numerous other transit lines.
- **Policy 31.3** – Provide rail transit service in an exclusive transit way from Fort Mason to the Southern Pacific Depot. An extension of Market Street surface rail, the F-Line should operate north of Market Street; the vehicles should be historic in character in order to provide a special waterfront transit identity. South of Market Street the transit service should be a surface extension of the MUNI Metro. Allow for continuous rail transit service along the length of the waterfront.

San Francisco Waterfront Special Area Plan (2000). The San Francisco Waterfront Special Area Plan, developed by the BCDC, is an amendment to the Bay Plan. The Special Area Plan does not supersede the San Francisco Bay Plan, rather it reconciles the differences between the Bay Plan and the Port's Waterfront Land Use Plan. The plan contains no specific policies or recommendations about transportation services in general or the project.

San Francisco Bicycle Plan (2009). The San Francisco Bicycle Plan, adopted in 1997 and updated in 2009, presents a guideline for the City to provide the safe environment and infrastructure needed to promote bicycling as a transportation mode. The Bicycle Plan is a comprehensive review of policies, procedures, practices and physical infrastructure of the city with respect to bicycling.

Bicycle Routes, Paths and Lanes. The existing bicycle network in San Francisco is composed of Class I, II, and III bikeways.[7]

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[4] San Francisco Northeastern Waterfront Plan, Adopted 1977, amended 1998 by the Board of Supervisors.
[5] The study area for the Northeastern Waterfront Area Plan is shown on Map 1 on Page II.9.6 of that document.
[6] For the purposes of the Northeastern Waterfront Area Plan, Policy 7.3 actually refers to connecting the facilities of the Northeastern Waterfront with those of the San Francisco Maritime National Historical Park (Aquatic Park), not the GGNRA.
[7] State of California, *California Streets and Highways Code*, Section 890.4.

- Class I (Bike Path) – Completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flow by motorists minimized.
- Class II (Bike Lane) – Provides a striped lane for one-way bicycle travel on a street or highway.
- Class III (Bike Route) – Provides for shared use with pedestrians or motor vehicle traffic.

As described in Chapter 3.3. Socioeconomics, the transportation and circulation study area currently is served by Bicycle Routes 2 and 25, with Routes 4 and 11 in the vicinity of the study area.

An update to the 1997 Bicycle Plan was initiated by the Bicycle Program in 2002. The resulting document was approved by the Board of Supervisors in 2005. In November of 2006, the Superior Court imposed an injunction on implementation of the Bicycle Plan until the City completes a full environmental review on the Plan. This injunction prohibits the City from making any physical streetscape changes recommended in the Bicycle Plan such as parking removal and lane re-allocation to accommodate bicycle lanes, installing shared-lane "sharrows" and/or U-rack bike parking racks. The draft environmental impact report, which will only apply to City of San Francisco streets and roadways, was certified in 2009.

As part of the updated Bicycle Plan, North Point Street is recommended for bicycle lanes from The Embarcadero to Van Ness Avenue as a Near-Term Improvement. To implement this bicycle project, one westbound travel lane on North Point Street between Stockton Street and Van Ness Avenue, and one eastbound travel lane between Stockton Street and The Embarcadero would be removed.

San Francisco Municipal Transportation Agency (SFMTA). SFMTA, through its San Francisco Municipal Railway (MUNI), is responsible for operating the historic streetcars, as well as other public transit services. SFMTA, through its Department of Parking & Traffic, is also responsible for traffic engineering functions within the City and County of San Francisco including recommendations to the SFMTA Board and the Board of Supervisors for traffic and parking regulations and enforcement.

San Francisco Municipal Transportation Agency (SFMTA) and City Controller's Office – Transit Effectiveness Project. The Transit Effectiveness Project (TEP) is a collaboration between the SFMTA and the City Controller's Office to review San Francisco's public transit system. The TEP has developed a set of staff recommendations that set forth a comprehensive strategy for growing with and meeting transit market demand in a dynamic city committed to a Transit First policy and sustainability for future generations. TEP recommendations are designed to make MUNI service more reliable, quicker and more frequent. On October 21, 2008, the SFMTA Board of Directors voted unanimously to endorse the TEP recommendations for the purpose of initiating any required environmental assessment.

Muni is experiencing budget problems and in order to address them, they are delaying implementation of TEP recommendations and made other changes to their services in December 2009 and May 2010. The recent service changes notwithstanding, the TEP recommendations include:

- Initiation of service on the E-Line using historic streetcars connecting Fisherman's Wharf (Jones Street terminal) and the northern waterfront to Caltrain Depot via The Embarcadero and King Street.

- Shifting of service on the F-Market [F-Line] from the a.m. peak to midday and p.m. peak to reduce crowding on the busiest times of day.
- 10-Townsend would be discontinued. Segments south of Broadway would be replaced by the modified 12-line and 47-line. Service on North Point would be provided by proposed 11-Downtown Connector. Service on the Embarcadero would be provided by the E- and F-lines.
- 11-Downtown Connector would provide a new bus line operating on Polk, North Point, Powell, Sansome, 2nd, Folsom, and 11th Streets, and Columbus Avenue. This line would provide North Beach with a connection to the Financial District / Montgomery Station.
- 19-Polk would be retained, but its northern terminus relocated to North Point Street.
- 20-Columbus would be discontinued and replaced by the new 11–Downtown Connector which would provide direct, all-day service between North Beach and the Financial District / Montgomery Station.
- 28-19th Avenue would terminate at the Golden Gate Bridge. Service to Marina would be provided by 28L; service to Fort Mason would be provided by 43-line. Late night and OWL coverage of Marina would be provided by 28 when 28L is not running.
- 28L-19th Avenue Limited would have all-day rapid, very limited-stop service—increasing access to SFSU and City College from Marina, Richmond, Sunset, and Excelsior. Service would be extended to Van Ness / North Point on Lombard St. and to Mission/Geneva via I-280.
- 43-Masonic would be extended from Chestnut/Fillmore to Fort Mason (Marina Blvd/Laguna), replacing the existing 28-line terminal. Service in the Presidio would be modified to connect to the Presidio Transit Center.
- 47-Van Ness would terminate at Van Ness and North Point. Service on North Point would be provided by the new 11-line.
- The TEP Enhanced Plan calls for the extension of the Historic Streetcar service to Fort Mason.

Fisherman's Wharf Public Realm Plan (2010). The Fisherman's Wharf Public Realm Plan is an inter-agency partnership, led by the San Francisco Planning Department. The Draft Plan, released in June 2010, presents new streetscape designs for the Wharf's streets, design guidelines for new development, a revamped parking and circulation plan, and proposals for new and refurbished public open spaces. Design concepts under consideration for the plan would designate Jefferson Street a Pedestrian Priority Street, and would reduce vehicle traffic volumes on Jefferson Street through wayfinding signage, and sidewalk and pavement design features. In addition, the plan contains parking management policies to provide more efficient use of the existing parking garages through use of dynamic signage with real-time parking information to direct drivers to those garages with the greatest number of available parking spaces.

3.5 AIR QUALITY

3.5.1 Introduction

This section evaluates the existing regional and local air quality conditions from both stationary and mobile sources of air emissions. Development of this section was based on a review of existing documentation of air quality conditions in the region, air quality regulations from the United States Environmental Protection Agency (EPA), the California Air Resources Board (CARB), the Bay Area Air Quality Management District (BAAQMD), and information related to the project description.

3.5.2 Regional Setting

Atmospheric conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. The project area lies in the northern San Francisco Peninsula climatological subregion. Marine air travelling through the Golden Gate is a dominant weather factor. Wind measurements collected in San Francisco indicate a prevailing wind direction from the west and an average annual wind speed of 10.6 miles per hour.[1] Increased temperatures create the conditions in which ozone formation can increase.

Criteria Air Pollutants. As required by the 1970 Federal Clean Air Act, the United States Environmental Protection Agency (USEPA) initially identified six criteria air pollutants that are pervasive in urban environments and for which state and federal health-based ambient air quality standards have been established. USEPA calls these pollutants criteria air pollutants because the agency has regulated them by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. Ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead are the six criteria air pollutants originally identified by USEPA. Since that time, subsets of particulate matter have been identified for which permissible levels have been established. These include particulate matter of 10 microns in diameter or less (PM_{10}) and particulate matter of 2.5 microns in diameter or less ($PM_{2.5}$).

The BAAQMD's air quality monitoring network provides information on ambient concentrations of criteria air pollutants at various locations in the San Francisco Bay Area. **Table 3.5-1** is a five-year summary of highest annual criteria air pollutant concentrations (2005 to 2009), collected at the BAAQMD's air quality monitoring station at 16th and Arkansas Streets, in San Francisco's lower Potrero Hill area, which is the closest monitoring station to the project site.[2] Table 3.5-1 compares measured pollutant concentrations with the most stringent applicable ambient air quality standards (State or Federal).

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[1] http://www.wrcc.dri.edu/htmlfiles/westwinddir.html#CALIFORNIA.

[2] Data from this single location does not describe pollutant levels throughout San Francisco, as these levels may vary depending on distance from key emissions sources and local meteorology. However, the BAAQMD monitoring network does provide a reliable picture of pollutant levels over time.

TABLE 3.5-1: SUMMARY OF SAN FRANCISCO AIR QUALITY MONITORING DATA (2005–2009)

Pollutant	Most Stringent Applicable Standard	Number of Days Standards were Exceeded and Maximum Concentrations Measured[a]				
		2005	2006	2007	2008	2009
Ozone						
- Days 1-hour Std. Exceeded		0	0	0	0	0
- Max. 1-hour Conc. (pphm)[c]	>9 pphm[b]	6	5	6	8	7
- Days 8-hour Std. Exceeded		0	0	0	0	0
- Max. 8-hour Conc. (pphm)[c]	>7 pphm[C]	5	5	5	7	6
Carbon Monoxide (CO)						
- Days 1-hour Std. Exceeded		0	0	0	0	ND
- Max. 1-hour Conc. (ppm)	>20 ppm[b]	2.9	2.9	2.7	5.7	ND
- Days 8-hour Std. Exceeded		0	0	0	0	0
- Max. 8-hour Conc. (ppm)	>9 ppm[b]	2.1	2.1	1.6	2.3	2.9
Suspended Particulates (PM_{10})						
- Days 24-hour Std. Exceeded[d]		0	3	2	0	0
- Max. 24-hour Conc. ($\mu g/m^3$)	>50 $\mu g/m^3$ [b]	46	**61**	**70**	41	36
Suspended Particulates ($PM_{2.5}$)						
- Days 24-hour Std. Exceeded[e]		0	3	5	0	1
- Max. 24-hour Conc. ($\mu g/m^3$)	>35 $\mu g/m^3$ [c]	44[e]	**54**	**45**	29	**36**
- Annual Average ($\mu g/m^3$)	>12 $\mu g/m^3$ [b]	9.5	9.7	8.7	9.8	ND
Nitrogen Dioxide (NO_2)						
- Days 1-hour Std. Exceeded		0	0	0	0	0
- Max. 1-hour Conc. (pphm)[c]	>25 pphm[b]	7	11	7	6	6
Sulfur Dioxide (SO_2)						
- Days 24-hour Std. Exceeded		0	0	0	0	ND
- Max. 24-hour Conc. (ppb)[c]	>40 ppb[b]	7	6	6	4	ND

Notes:

Bold values are in excess of applicable standard. "NA" indicates that data is not available.
conc. = concentration; ppm = parts per million; pphm = parts per hundred million; ppb=parts per billion;
μg/m3 = micrograms per cubic meter
ND = No data or insufficient data.

[a] Number of days exceeded is for all days in a given year, except for particulate matter. PM_{10} and $PM_{2.5}$ are monitored every six days and therefore the number of days exceeded is out of approximately 60 annual samples.
[b] State standard, not to be exceeded.
[c] Federal standard, not to be exceeded.
[d] Based on a sampling schedule of one out of every six days, for a total of approximately 60 samples per year.
[e] Federal standard was reduced from 65 μg/m3 to 35 μg/m3 in 2006.

SOURCE: BAAQMD, Bay Area Air Pollution Summary, 2005 – 2009. Available online at: http://www.baaqmd.gov/Divisions/Communications-and-Outreach/Air-Quality-in-the-Bay-Area/Air-Quality-Summaries.aspx and http://www.arb.ca.gov/adam/cgi-bin/db2www/adamtop4b.d2w/start

Ozone. Ozone is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gasses (ROG) and nitrogen oxides (NO_X). Significant ozone production generally requires about three hours in a stable atmosphere with strong sunlight. Ozone is a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production. Motor vehicles are the major source of ozone precursors in the Bay Area. Ozone causes eye and respiratory irritation, reduces resistance to lung infection, and may aggravate pulmonary conditions in persons with lung disease. Ozone also damages vegetation and untreated rubber. As shown in Table 3.5-1, the state ozone standard was not violated in the past five years at the San Francisco monitoring station.

Carbon Monoxide (CO). Carbon monoxide is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. Motor vehicles are the major contributors to CO generation. Ambient CO concentrations normally correspond closely to the spatial and temporal distributions of vehicular traffic. Wind speed and atmospheric mixing also influence CO concentrations. Under inversion conditions, CO concentrations may be distributed more uniformly over an area out to some distance from vehicular sources. High concentrations of CO in respired air can impair the ability of the human body to absorb oxygen into the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches, and dizziness. As shown in Table 3.5-1, measured CO levels at the San Francisco monitoring station have not violated the state eight-hour standard in the last five years.

Particulate Matter (PM_{10} and $PM_{2.5}$). PM_{10} consists of particulates 10 microns (a micron is one one-millionth of a meter) or less in diameter and $PM_{2.5}$ consists of particulates 2.5 microns or less in diameter. Both PM_{10} and $PM_{2.5}$ represent fractions of particulate matter which can be inhaled deeply into the lungs and cause adverse health effects. Particulates in the atmosphere result from many kinds of dust- and fumes-producing industrial and agricultural operations, combustion, and atmospheric photochemical reactions. Some of these operations, such as demolition and construction activities, contribute to increases in local particulate matter concentrations, while others, such as vehicular traffic, affect regional particulate matter concentrations.

Natural sources of particulates include wind erosion from exposed surfaces. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain adsorbed gases (e.g., chlorides or ammonium) that may be injurious to health. Particulates can also damage materials and reduce visibility.

Both PM_{10} and $PM_{2.5}$ data are collected at the San Francisco station. Both PM_{10} and $PM_{2.5}$ data are collected every six days with approximately 60 sampling days per year. Table 3.5-1 shows that the PM_{10} standard was violated in two of the past five years, for a total of five days over approximately 300 sampling days. The national 24-hour standard for PM_{10} was not exceeded during the last five years. The federal 24-hour $PM_{2.5}$ standard was violated in three of the past five years, for a total of nine days over approximately 300 sampling days. The state and national annual average standards for $PM_{2.5}$ were not exceeded during the last five years.

Other Criteria Air Pollutants. The standards for nitrogen dioxide, sulfur dioxide, and lead are being met within the region, and trends in historical data of ambient concentrations of these pollutants show no signs of violating state or federal standards in the future (CARB 2009).

Non-Criteria Air Pollutants. Toxic air contaminants (TACs) are air pollutants that may lead to serious illness or increased mortality, even when present in relatively low concentrations. Potential human health effects of TACs include birth defects, neurological damage, cancer, and death. There are hundreds of different types of TACs with varying degrees of toxicity. Individual TACs vary greatly in the health risk they present; at a given level of exposure, one TAC may pose a hazard that is many times greater than another.

TACs do not have ambient air quality standards, but are regulated by the BAAQMD using a risk-based approach. This approach uses a health risk assessment to determine what sources and pollutants to control as well as the degree of control. A health risk assessment is an analysis of exposure to toxic substances and human health risks from exposure to toxic substances is estimated, based on the potency of the toxic substances.[3]

While diesel particulate matter (DPM) was identified as a TAC by the CARB in 1998, BAAQMD monitors PM_{10} and $PM_{2.5}$ concentrations only and does not currently differentiate the DPM component of particulate emissions.

Sensitive Receptors. Some receptors are considered more sensitive than others to air pollutants. The reasons for greater sensitivity than average include pre-existing health problems, proximity to the emissions source, or duration of exposure to air pollutants. Land uses such as primary and secondary schools, hospitals, and convalescent homes are considered to be relatively sensitive to poor air quality because the very young, the old, and the infirm are more susceptible to respiratory infections and other air quality-related health problems than the general public. Residential areas are considered sensitive to poor air quality because people in residential areas are often at home for extended periods. Recreational land uses are moderately sensitive to air pollution, because vigorous exercise associated with recreation places a high demand on the human respiratory function.

Plant and animal species may also be sensitive to poor air quality; however, adopted state and federal air quality standards were developed to protect the health of the most sensitive human populations. The sensitivity of animals to air pollutant concentrations can vary substantially depending on an animal's lung capacity and respiration rate as well as many other factors. High ozone concentrations and accumulation of particulate matter can be damaging to sensitive plant species. The affected environment and potential impacts to biological resources is addressed separately in Biological Resources Sections 3.12 and 4.12 of the document, respectively.

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[3] In general, a health risk assessment is required (for permitting approval) if the BAAQMD concludes that projected emissions of a specific air toxic compound from a proposed new or modified source suggest a potential public health risk, then the applicant is subject to a health risk assessment for the source in question. Such an assessment generally evaluates chronic, long-term effects, calculating the increased risk of cancer as a result of exposure to one or more TACs. Hazard indices are also typically calculated for acute and chronic non-cancer risks, if applicable to the TACs of concern.

The only existing residential units located immediately adjacent to the proposed streetcar track are the upper level apartments at 2765 Hyde Street, located above the Buena Vista Cafe. There are other residential buildings further back from the proposed alignment, for example the residential towers (Fontana Towers) located on North Point (between Polk and Van Ness), but these buildings are considerably more distant from the future streetcar tracks than 2765 Hyde Street. Sensitive receptors nearest the two proposed loop locations are residential condominiums on Laguna Street between North Point Street and Bay Street.

3.5.3 Greenhouse Gas Emissions

State of California and City of San Francisco. The State of California contributes approximately seven percent of US GHG emissions, making it second among the states (SFMTA 2008a). Although California has one of the lowest GHG emission rates on a per capita basis (approximately 11 metric tons per person per year), it still exceeds what is sustainable in order to stabilize the earth's climate. Furthermore, because the state has such a large population (over 36 million) that is rapidly growing (46 million projected by 2025), the impacts of California's contribution to the problem is amplified. Although the state population comprises less than 0.6 percent of the world's population, California contributes two percent of global, human generated GHGs (SFMTA 2008a). Burning fossil fuels for transportation is the primary contributor to GHG in California.

According to the San Francisco Climate Action Plan, in 2000 the City of San Francisco emitted approximately 9.7 million tons of GHGs (SF Dept. of Env. 2004). Approximately half of these emissions were generated by the transportation sector which includes all road vehicles, rail vehicles, and cross-Bay ferries. In 2000, emissions associated with transportation sources totaled approximately 5.1 million tons of CO2, an increase of 10 percent from 1990 levels. By 2010, transportation emissions are projected to increase to approximately 5.5 million tons (SF Dept. of Env. 2004).

The most efficient non-polluting forms of transportation, on a per passenger mile basis, are walking, bicycling and riding the San Francisco Municipal Transportation Agency (SFMTA) electric vehicles, which include trolley buses, light rail vehicles, historic streetcars and cable cars. Other forms of public transportation, such as BART, Caltrain and Muni's diesel buses, also emit substantially less CO2 per passenger mile than driving (both single-occupant vehicles and carpools) (SFMTA 2008a). As such, one strategy for combating climate change is shifting people from automobiles to lower emitting forms of transportation. However, vehicle miles traveled in San Francisco County have been steadily increasing since 1990, and are projected to grow from 3,363 million miles in 1990 to 4,137 million miles in 2010 (SF Dept. of Env. 2004).

Golden Gate National Recreation Area. As part of its 2008 Golden Gate National Recreation Area Climate Change Action Plan, the National Park Service and the EPA performed a comprehensive GHG emissions inventory for the GGNRA, which did not include the San Francisco Maritime National Historical Park (NPS 2008b). The inventory was completed using the NPS's Climate Leadership in Parks (CLIP) tool, and divided emissions into three categories:

(1) Energy, including generators, furnaces, dryers, hot water heaters, and purchased electricity;

(2) Transportation, including vehicle miles traveled by park fleet, visitor vehicles, and the Alcatraz Ferry; and

(3) Waste, including the emissions from wastewater treatment and municipal solid waste decomposition.

The inventory found that, in 2006, total emissions for the GGNRA equaled approximately 10,319 metric tons of carbon equivalent (MTCE). The majority of these emissions, 88 percent, were from the 13 million visitors the park receives every year, who generated an estimated 73 million vehicle miles traveling to and from the GGNRA (NPS 2008b). With the exception of emissions attributable to Alcatraz, the inventory did not break down the emissions into individual parks within the GGNRA.

San Francisco Maritime National Historical Park. The SF Maritime NHP conducted a separate inventory using the CLIP tool. This inventory found that, in 2008, total emissions from SF Maritime NHP totaled approximately 492 MTCE. The largest emission sector for SF Maritime NHP is energy, totaling 356 MTCE. The transportation emissions are very low because there are few places for visitors to drive within the boundaries of the park.

3.5.4 Regulations and Policies

Federal Policies

Executive Order 13423, Issued by President George W. Bush, Jan. 24, 2007. This Executive Order sets as a policy of the United States that "Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner" (Section 1, Policy). Goals for agencies include such measures as: improving energy efficiency and reducing GHGs of the agency through reductions of energy intensity and by requiring that renewable energy consumed by the agency comes from new renewable sources; reducing water consumption intensity; and ensuring that agencies reduce their fleet's total consumption of petroleum products (NPS 2008b).

2006 National Park Service Management Policies

4.7.1 Air Quality. The National Park Service has a responsibility to protect air quality under both the 1916 Organic Act and the Clean Air Act (CAA). Accordingly, the Service will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas. Vegetation, visibility, water quality, wildlife, historic and prehistoric structures and objects, cultural landscapes, and most other elements of a park environment are sensitive to air pollution and are referred to as "air quality-related values." The Service will actively promote and pursue measures to protect these values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the Service will err on the side of protecting air quality and related values for future generations.

National Parks Service Climate Friendly Parks Program. A joint program of the U.S. Environmental Protection Agency and National Park Service, the Climate Friendly Parks Program helps parks reduce GHG emission by developing alternative transportation systems, designing and constructing sustainable facilities, and developing plans to reduce energy and water use (NPS 2008b).

National Parks Service Pacific West Region Directive PW-047, October 31, 2006. This directive provides policies pertaining to on-site generated renewable energy. Specifically, the conversion to renewable sources of energy is encouraged, and purchasing of Green Power (including wind, solar, biomass, and geothermal) is allowed when on-site renewable energy systems are not feasible. Alternatively purchasing Green Power Tags is also permitted (NPS 2008b).

State Policies

Executive Order S-3-05. In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger established Executive Order S-3-05, which set forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

Assembly Bill 32 – California Global Warming Solutions Act of 2006. California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006, was enacted in 2006 and requires the California Air Resources Board (CARB) to establish a statewide GHG emission cap for 2020 based on 1990 emission levels. AB 32 required CARB to adopt regulations by January 1, 2008, that identified and required selected sectors or categories of emitters of GHGs to report and verify their statewide GHG emissions, and CARB is authorized to enforce compliance with the program. Under AB 32, CARB was also required to adopt, by January 1, 2008, a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990, which must be achieved by 2020. By January 1, 2011, CARB is required to adopt rules and regulations (which shall become operative January 1, 2012), to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 permits the use of market-based compliance mechanisms to achieve those reductions. AB 32 also requires CARB to monitor compliance with and enforce any rule, regulation, order, emission limitation, emissions reduction measure, or market-based compliance mechanism that it adopts.

Climate Change Scoping Plan, December 2008. In 2008 CARB released a Scoping Plan outlining the State's strategy to achieve the 2020 GHG emissions limit (CARB 2008). This Scoping Plan, developed by CARB in coordination with the Climate Action Team (CAT), proposes a comprehensive set of actions designed to reduce overall GHG emissions in California, improve the environment, reduce dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health. It was adopted by the Board at its meeting in December 2008. The measures in the Scoping Plan approved by the Board will be developed over the next two years and be in place by 2012. The Scoping Plan expands the list of nine Early Action Measures into a list of 39 Recommended Actions contained in Appendixes C and E of the Plan.

Local Policies

The Golden Gate National Recreational Area Climate Change Action Plan, December 2008. In December of 2008 the GGNRA published its report, the Golden Gate National Recreation Area Climate Change Action Plan, with the objective of identifying actions that GGNRA can undertake to reduce GHG emissions, and thereby address climate change. The plan presents the park's emission reduction targets and associated reduction strategies designed to achieve the park's emission reduction goals. Specifically, the plan provides the GGNRA's goals and objectives, climate change background, an inventory of GHG emissions and criteria air pollutants, and four strategies: (1) Reduce GHG emissions resulting from activities within and by the Park; (2) Plan and adapt to future impacts of climate change; (3) Increase climate change education and outreach; and (4) Evaluate progress and identify areas for improvement (NPS 2008b).

The Golden Gate National Recreational Area Environmental Management System (GGNRA ESM). The purpose of GGNRA's EMS is a tool to be used to help ensure compliance with regulatory requirements, and maintain the Park's commitment to pollution prevention, sustainable planning, environmentally preferable purchasing, waste reduction, and the incorporation of environmental best management practices. Per requirements of Executive Order 13148, GGNRA completed its first EMS in December of 2005, and has updated the targets annually since then. Objectives and measurable goals from the Climate Change Action Plan will be included in future updates to the EMS (NPS 2008b).

The Golden Gate National Recreational Area General Management Plan, 1980 (GGNRA GMP). The GGNRA GMP, completed in 1980, is the master plan document for the entire GGNRA. The document describes the existing character and setting of the GGNRA and sets forth goals for future development within the park. The document is made up of two parts: the Plan, which guides development policy within the park; and The Environmental Analysis, which describes the environmental impacts The Plan may incur if implemented (NPS 1980). The GMP is currently in the process of being revised, with plans for the updated GMP to consider the goals and objectives defined in the GGNRA Climate Change Action Plan. In addition, the updated GMP will summarize the guiding principles by which GGNRA will reduce emissions, educate, and adapt to climate change over the next 20 years (NPS 2008a).

San Francisco Maritime National Historical Park Climate Change Action Plan, 2010. Similar to the Golden Gate National Recreation Area, the SF Maritime NHP prepared a Climate Change Action Plan with the objective of identifying actions that can be taken to reduce GHG emissions, and thereby address climate change. The plan presents the park's emission reduction targets and associated reduction strategies designed to achieve the park's emission reduction goals. Specifically, the plan provides the park's goals and objectives, climate change background, an inventory of GHG emissions and criteria air pollutants, and three strategies: (1) Identify and implement mitigation actions that the park can take to reduce GHG emissions resulting from activities within the park; (2) Increase climate change education and outreach efforts; and (3) Monitor progress with respect to reducing emissions and preserving natural and cultural resources and infrastructure and identify areas for improvement (NPS 2010a).

San Francisco Municipal Transportation Agency (SFMTA) 2009 Climate Action Plan, 2008. SFMTA published a draft for public review of its 2009 Climate Action Plan in December of 2008. The

Plan details policies, program, goals, funding and relationships with other City departments to reduce GHG emissions in the transportation sector and in agency operations. Specifically, the Plan discusses the City of San Francisco's emission reduction targets, establishes targets and goals for the SFMTA, describes the threat of climate change to the area, outlines how SFMTA will measure plan and program success, highlights existing climate change mitigation measures and the SFMTA's internal footprint, and identifies additional climate action programs and efforts, as well as potential and necessary next steps for the Agency (SFMTA 2008a).

Climate Action Plan for San Francisco, September 2004. Completed by San Francisco's Department of the Environment and Public Utilities Commission, this Climate Action Plan establishes a GHG emissions reduction target for the City of 20 percent below 1990 levels by 2012. The plan also provides background information on climate change causes and local impacts, provides a GHG inventory of City emissions, highlights actions to reduce San Francisco's GHG emissions, and develops an implementation strategy for the near term (SF Dept. of the Env. 2004).

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3.6 NOISE AND VIBRATION

3.6.1 Noise Concepts and Terminology

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Sound is characterized by various parameters that include the rate of oscillation of sound waves (frequency), the speed of propagation, and the pressure level or energy content (amplitude). In particular, the sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound level. Sound pressure level is measured in decibels (dB), a logarithmic loudness scale with zero dB corresponding roughly to the threshold of human hearing, and 120 to 140 dB corresponding to the threshold of pain. Because sound pressure can vary by over one trillion times within the range of human hearing, the logarithmic loudness scale is used to calculate and manage sound intensity numbers conveniently.

The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts, sound is measured using an electronic filter that de-emphasizes the frequencies below 1,000 Hz and above 5,000 Hz in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies instead of the frequency mid-range. This method of frequency weighting is referred to as A-weighting and is expressed in units of A-weighted decibels (dBA). Frequency A-weighting follows an international standard methodology of frequency de-emphasis and is typically applied to community noise measurements.

Given the variation of community noise level from instant-to-instant, community noise levels must be measured over an extended period of time to characterize a community noise environment and evaluate cumulative noise impacts. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The equivalent sound level is used to describe noise over a specified period of time, typically one hour, in terms of a single numerical value. The L_{eq} is the constant sound level which would contain the same acoustic energy as the varying sound level, during the same time period (i.e., the average noise exposure level for the given time period).

L_{max}: The instantaneous maximum noise level measured during the measurement period of interest.

L_x: The sound level that is equaled or exceeded x percent of a specified time period. The L_{50} represents the median sound level (i.e., the noise level exceeded 50 percent of the time).

DNL: The day-night average sound level (DNL, also written as L_{dn}) is the energy average of the A-weighted sound levels occurring during a 24-hour period, accounting for the greater sensitivity of most people to nighttime noise by weighting ("penalizing") nighttime noise levels by adding 10 dBA to noise between 10:00 p.m. and 7:00 a.m.

CNEL: Similar to the DNL, the Community Noise Equivalent Level (CNEL) adds a 5-dBA "penalty" for the evening hours between 7:00 p.m. and 10:00 p.m. in addition to the 10-dBA penalty between the hours of 10:00 p.m. and 7:00 a.m.

SEL: The sound exposure level (SEL) is a time integrated metric which quantifies the total energy in A-weighted noise level measured during a particular single event referenced to time duration of 1 second.

3.6.2 Vibration Concepts and Terminology

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. The peak particle velocity (PPV) is usually used to describe vibration amplitudes. PPV is defined as the maximum instantaneous peak of the vibration signal. Since ground-shaking speeds are generally quite low, it is measured in inches per second (in/s). Typically, groundborne vibration generated by man-made activities attenuates rapidly with distance from the source of the vibration. Man-made vibration issues are therefore usually confined to short distances (i.e., 500 feet or less) from the source.[1] Standard industry damage criteria and "safe levels" of ground motion are generally based on particle velocity and frequency of motion. The response of humans to ground motion is primarily influenced by ground motion velocity and duration of the motion.

Persons not familiar with vibration science often confuse particle velocity values with ground displacement. For instance, if a measured peak or maximum particle velocity is 0.25 inches per second, the ground has *not* moved a quarter of an inch. The actual temporary particle movement or displacement would be much less because in one second of time, ground particles disturbed by vibration waves will oscillate back and forth many times in a second.

Another useful vibration descriptor is known as vibration decibels or VdB. VdB's are generally used when evaluating human response to vibrations, as opposed to structural damage, where PPV is the more commonly used descriptor. Vibration decibels are established relative to a reference quantity, typically 1×10^{-6} inches per second.[2]

3.6.3 Soundscapes

In a park setting, a natural soundscape is an area characterized by certain characteristic sound sources at detectable sound levels which typically occur without the intrusion of sounds caused by humans or human technology. Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Natural sounds occur within and beyond the range of sounds that humans can perceive, and they can be transmitted through air, water, or solid materials (NPS 2006).

The natural soundscape is viewed as a resource and as a value to be appreciated by visitors. Many park visitors have an expectation of seeing, hearing and experiencing phenomena associated with a specific natural environment. While the Fort Mason Center and SF Maritime NHP are located in an urbanized

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[1] Federal Transit Administration, Transit Noise and Vibration Impact Assessment, 2006.

[2] Ibid.

area of San Francisco, natural soundscape elements such as sea birds and tidal motions of the bay can be heard around western Aquatic Park.

The study area may be characterized as being located within a cultural or historic soundscape as the result of its location on the San Francisco waterfront and the noise sources that have historically been associated with its maritime locale. These noise sources would include bells from cable car operations of the Hyde/Powell Street line and occasional ship navigational aids such as fog horns at the Golden Gate Bridge and directional horn warnings used by cargo ships within the maritime traffic lanes.

3.6.4 Ambient Noise Environment

Ambient noise levels in the project area were measured during noise monitoring surveys conducted in 2006 and 2008 (Wilson Ihrig 2009). **Figure 3.6-1** shows the locations where noise and vibration measurements were taken. The highest noise levels measured during the noise surveys were generally obtained along Beach, Jefferson, Leavenworth and Jones Streets; the streets in the study area with the highest traffic volumes. The Day-Night Average Sound Level (Ldn) values obtained at the long-term monitoring locations and the Ldn values estimated at the short-term monitoring locations, along these streets, were either close to or above 70 dB. Daytime hourly average Leq values at these locations were monitored to be 68 dB. These levels are fairly typical of busy urban streets. At the monitoring location near the NHL Aquatic Park Bathhouse Building (Maritime Museum) and near the western end of Beach Street, just past this building, the noise levels were typically below 65 dB Ldn due to the lower traffic volumes in this area. At the park area near the east portal of the abandoned tunnel the noise levels were typically below 60 dB Ldn. Daytime hourly average Leq values at this location was monitored to be 49 dB.

Upper Fort Mason is generally a comparatively quiet area, apart from the southern part closest to Bay Street, with existing noise levels below 60 dB Ldn in the areas closest to the rail tunnel. The residences near the tunnel are some distance from Bay Street and there is usually little traffic on the roads within Upper Fort Mason. Fort Mason Center is also comparatively quiet, with existing noise levels of approximately 60 dB Ldn at the south end of Landmark Buildings B and C. Daytime hourly average Leq values at this location was monitored to be 65 dB. The main noise source in this area is traffic movements into and out of the parking lot. Noise levels are somewhat higher due to traffic in the vicinity of Laguna and North Point Streets where the existing noise levels are typically greater than 65 dB Ldn near the streets, but generally 2 to 3 dB lower when away from Laguna Street and in the park area.

3.6.5 Ambient Vibration Environment

At the monitoring locations along streets with high traffic volumes in the study area where there are no streetcar operations, the ground vibration levels were monitored to be typically less than 70 VdB, and the vibration was not, subjectively, noticeable. This includes the corner of Beach Street and Larkin Street, approximately 350 feet from the Maritime Museum.

Source: Wilbur Smith Associates, 2004; NPS

LEGEND

- F Market (existing)
- Fort Mason Extension (proposed)
- Platform (existing)
- Platform (proposed)

NOISE AND VIBRATION MONITORING LOCATIONS AND VALUES

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FIGURE 3.6-1

The ground vibration levels at the monitoring locations in Upper Fort Mason and in the Fort Mason Center were relatively lower. The maximum vibration level recorded during the 15-minute sample at the south end of Landmark Building A in the Fort Mason Center was 58 VdB. The maximum vibration level recorded during the 15-minute sample on the sidewalk in front of Buildings 232 and 234 in Upper Fort Mason was 45 VdB. These levels are well below the threshold of human perception.

3.6.6 Noise and Vibration Sensitive Land Uses

Existing buildings and facilities that would be located adjacent to the extended streetcar line between Jones Street and the entrance to the rail tunnel (below Upper Fort Mason) include:

- The Holiday Inn Hotel at 1300 Columbus Avenue.
- The Courtyard by Marriott at 580 Beach Street.
- The Argonaut Hotel at 495 Jefferson Street.
- The Cannery, located adjacent to The Argonaut Hotel and bounded by Jefferson, Beach, and Leavenworth Streets. The Cannery has shops, restaurants, offices, and a jazz club
- The cable car turnaround at Hyde and Beach Streets and the neighboring park and seafront areas, which extend to the west beyond the disused rail tunnel entrance.
- Ghirardelli Square at 900 North Point Street, which has shops, restaurants, residences and galleries.
- San Francisco Senior Center at 890 Beach Street in the NHL Aquatic Park Bathhouse Building (Maritime Museum).
- The NHL Aquatic Park Bathhouse Building (Maritime Museum) at 900 Beach Street.
- Other commercial/office buildings, shops, galleries, cafe/restaurants and bars.
- The West Roundhouse (“Convenience Station”)

The only existing residential units located immediately adjacent to the proposed streetcar track are the upper level apartments at 2765 Hyde Street, located above the Buena Vista café and newly available residential units on the upper floors of Ghirardelli square at 900 North Point (with frontage on Beach Street). There are other residential buildings further back from the proposed alignment, for example the residential towers (Fontana Towers) located on North Point (between Polk and Van Ness), but these buildings are considerably more distant (about 250 feet)from the future streetcar tracks than those on Hyde Street.

The existing abandoned rail tunnel is almost directly below some of the historic residential buildings in Upper Fort Mason. Buildings 2, 7, 11, 231, 232, and 235 are the closest residential buildings to the tunnel.

Fort Mason Center is a multicultural center, which hosts events, conferences, performances and exhibits. The facilities in the five Landmark Buildings (A through E) at the Fort Mason Center include:

- Offices;
- Conference areas;

- Theaters;
- Meeting/activity spaces;
- Restaurant;
- Bookstore;
- Library; and
- Educational facilities (including a school of music).

The five Landmark Buildings could be as close as 80 feet to the turnaround track, depending on the final selected location. The pavilions and other facilities on the three piers are considerably more distant from the proposed alignment and turnarounds (400 feet or more).

Residential land uses nearest the two proposed turnaround loop locations are condominiums on Laguna Street between North Point Street and Bay Street, approximately 400 feet from the northern loop and 100 feet from the southern loop.

3.6.7 Regulations and Policies

2006 National Park Service Management Policies. The 2006 National Park Service Management Policies delineate its Soundscape Management Polices. These policies are designed in accordance with the Organic Act of 1916 and strive to manage National Parks in a way that will preserve them for the enjoyment of future generations. The National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks. Some natural sounds in the natural soundscape are also part of the biological or other physical resource components of the park. Examples of such natural sounds include:

- Sounds produced by birds, frogs, or katydids to define territories or aid in attracting mates;
- Sounds produced by bats or porpoises to locate prey or navigate;
- Sounds received by mice or deer to detect and avoid predators or other danger;
- Sounds produced by physical processes, such as wind in the trees, claps of thunder, or falling water.

National Park Service will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts. Using appropriate management planning, superintendents will identify what levels and types of unnatural sound constitute acceptable impacts on park natural soundscapes.

The frequencies, magnitudes, and durations of acceptable levels of unnatural sound will vary throughout a park, being generally greater in developed areas. In and adjacent to parks, National Park Service will monitor human activities that generate noise that adversely affect park soundscapes, including noise caused by mechanical or electronic devices. National Park Service will take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored.

Director's Oder 47 – Soundscape Preservation and Noise Management. Directors Orders are one of several types of written guidance created for the proper management of national parks. The key directive from Director's Order 47 is that where natural soundscape conditions are currently not impacted by inappropriate noise sources, the objective must be to maintain those conditions. Where the soundscape is found to be degraded, the objective is to facilitate and promote progress toward the restoration of the natural soundscape. There are eleven instructions and requirements outlined in Director's Order 47.

Local Noise Regulations. San Francisco's Plan for Transportation Noise Control (a section of the Environmental Protection Element) provides guidance on the environmental noise levels that are considered generally acceptable for residential and other land uses. The Plan provides land-use compatibility guidelines in terms of the Day-Night Average Sound Level (Ldn). The compatibility guidelines for single-family and multi-family residential land uses identify the following categories:

- Areas with an Ldn of less than 60 dB are considered satisfactory for residential development, with no special building noise insulation requirements.
- Areas with an Ldn of between 60 and 70 dB are identified as conditionally acceptable for residential land uses, pending an assessment of the need for and installation of noise insulation features, typically identified in a noise study report.
- Areas with an Ldn above 70 dB are generally considered incompatible with residential land uses and development of residences in these areas are generally discouraged.

With regard to construction noise, the San Francisco Noise Ordinance (Article 29 of the San Francisco Police Code) prohibits the operation of any powered construction equipment emitting noise at a level in excess of 80 dBA at 100 ft., or an equivalent sound level at some other distance. This limit does not apply to impact tools and equipment, such as pile drivers, pavement breakers, and jackhammers, provided such equipment is fitted with approved noise control features.

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3.7 CULTURAL RESOURCES

3.7.1 Introduction

The following section summarizes the results of previous studies developed for the project area, provides the cultural resource context, and establishes the regulatory framework for the undertaking.[1] Section 106 Regulations (36 CFR Part 800.8) state that preparation of an EIS and ROD under NEPA should include appropriate scoping, identification of historic properties, assessment of effects upon them, and consultation leading to resolution of any adverse effects. To that end, this section identifies historic properties and Chapter 4.0 will assess the effects (or impacts) of the project (or undertaking) on these historic properties.

3.7.2 Area of Potential Effect

An area of potential effect (APE) describes the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties. The APE for this undertaking was identified in a letter to the State Historic Preservation Officer (SHPO), Wayne Donaldson, FAIA, dated August 2, 2007. See **Figure 3.7-1** – APE Map. SHPO concurred with the proposed APE in a letter dated December 3, 2007 (see Appendix C). The boundaries of the APE generally encompass an area from Taylor Street to the east, Laguna Street to the west, the San Francisco Bay to the north, and Bay Street to the south.

3.7.3 Cultural Setting

Pre-contact Setting. Human settlement of the San Francisco Bay region began sometime during the early Holocene period ca. 10,000 years ago. During this period, the mean sea level elevation was considerably lower than today and the area now encompassed by the San Francisco Bay was over 30 miles inland from the coastline. Sea levels rose and, by 8,000 years ago, marine waters began to inundate San Francisco Bay. Except for brief periods, the mean sea level has been at or above its present level for some 6,000 years (Moratto 1984:221-223).

Archeological investigations in the San Francisco Bay Area have generally concentrated on the littoral regions bordering the bay, and concentrated on large shellmound sites. The first detailed survey of the Bay Area was by N. C. Nelson from 1906-1908 along the coast from Half Moon Bay to the Russian River (Nelson 1909). This survey resulted in the documentation of 425 midden deposits[2] including Ca-SFr-2 near the current intersection of Third and Harrison Streets, and Ca-SFr-7 near Hunters Point.

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[1] An undertaking as defined by Section 106 Regulations (36 CFR Part 800) means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval.

[2] A midden is a mound of domestic refuse generally containing culturally darkened soils, shells and animal bones, as well as other indices of past human life and habitation. Middens mark the site of an indigenous settlement, and may contain human burials related to that settlement.

Source: Page & Turnbull

APE Boundaries
Parcels Surveyed
Identified Historic Properties

AREA OF POTENTIAL EFFECT

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FIGURE 3.7-1

Data from these and later excavations were used to extend the Central California Taxonomic System (CCTS) classifications of the Central Valley cultures to include those in the San Francisco Bay area (Beardsley 1954). One feature of the CCTS is the designation of "horizons," broad cultural units with temporal characteristics. The system recognizes three cultural horizons: Early, Middle, and Late. Each cultural horizon is defined by groups of diagnostic traits and characteristic artifacts called facies. Groups of facies comprise a province. The facies and province were defined both culturally by characteristic traits and artifacts, as well as spatially by the locales where the facies were found.

By circa 500 B.C., Ohlone/Costanoan peoples occupied essentially the same territory that they would until Euro-American contact (Moratto 1984:279). This territory extended from the Carquinez Strait southward to the Sur River and from the Pacific coast eastward to the Diablo Range (Kroeber 1976:462; Moratto 1984:225). The San Francisco Peninsula was occupied by speakers of Ramaytush or San Francisco Costanoan, one of eight Ohlone/Costanoan Indian languages spoken in California. Costanoan is derived from the Spanish term Costanos for "coast people"; however, it does not represent a cohesive ethnic group, and is no longer widely used to refer to the people of the region, who generally prefer the name Ohlone. Instead, Costanoan is a linguistic division, grouping eight languages together due to their phonological similarities. Together with the Miwokan languages, Costanoan comprises the Utian Family of languages. In turn, the Utian Family is part of the larger Penutian Linguistic Stock (Kroeber 1976; Levy 1978; Moratto 1984; Shipley 1978; Milliken 1995).

Ohlone territory was significantly affected by Spanish colonialism in California. Between 1769 and 1776, seven Spanish expeditions entered the Ohlone lands and, by the close of the eighteenth century, seven missions had been established. At the time of these early contacts approximately 10,000 Ohlone Indians existed, comprising roughly 50 politically autonomous community groups (Cook 1943a; 1943b).

The Ohlone, like most aboriginal Californians, possessed no larger socio-political organization than small local tribes comprised of 50-500 people (Kroeber 1976; Levy 1978). Groups were generally composed of one or more loosely affiliated villages and associated logistical camps situated within a recognized territory. Leadership was inherited patrilineally, generally passing from father to son, although women could also hold the office (Levy 1978:487).

The subsistence strategy of the Ohlone peoples revolved around the procuring of wild vegetal and animal foodstuffs. Vegetal products were gathered as they became seasonally available, and then were either consumed or stored for future use. Acorns, if regularly available, were the staple plant food. If a particular group inhabited an area devoid of oaks (e.g., the coast), then seed procurement predominated (Kroeber 1976:467; Levy 1978:491).

Fish and mollusks were a significant component of the diet. Salmonids (i.e., steelhead and salmon) were captured during their spawning migrations by hook and line or seine nets. Mussels and abalone were simply pried from the coastal rocks. Kroeber (1976:466) stated that the shellmounds situated around San Francisco Bay are the richest in California, "except perhaps the Santa Barbara Islands," attesting to the importance of mollusks to aboriginal sustenance in this vicinity. He further noted that it is probable that "the upper layers of nearly all" of the shellmounds (within Ohlone territory) "must accordingly be ascribed to the Costanoans" (Kroeber 1976:466).

Historic-Period Setting. As a result of the Cabrillo expedition of 1542-1543, the southbound passage of the Manila Galleon along the coast after 1565, and subsequent voyages of exploration by Cermmenho in 1597 and Vizcaino in 1602, the California coastline was familiar to navigators by the end of the sixteenth century (Donley et al. 1979). Conversely, the interior remained unknown until the eighteenth century. Initial European exploration of the Project vicinity was initiated in 1769 and lasted until 1810. During this period, a number of Spanish expeditions penetrated the territory occupied by the Costanoan peoples. Between 1769 and 1776, forays led by Portola, Ortega, Fages, Fages and Crespi, Anza (two expeditions), Rivera, and Moraga were carried out. Favorable reports led to the founding of seven missions in the region between 1770 and 1797.

In the spring of 1776, the site of San Francisco was chosen by Juan Batista Anza for the establishment of a mission and military post. Later that same year, the Mission San Francisco de Asís (also known as Mission Dolores) and Presidio de San Francisco were officially dedicated and Jose Joaquin Moraga (Anza's lieutenant) took formal possession in the name of King Carlos III (Hoover et al. 1990:331-334).

Several local tribes of the San Francisco bayshore moved to Mission Dolores in their entirety. The Yelamu local tribe, no more than 160 individuals, held the tip of the San Francisco Peninsula north of San Bruno Mountain. The greater part of the Peninsula lands of the GGNRA, including the Presidio, Fort Funston, Fort Mason, Fort Miley, Lands End, Ocean Beach, and Alcatraz Island, were within their territory. Most Yelamu people were baptized between 1777 and 1784 at Mission Dolores (Milliken et al. 2009).

The Spanish annexation and colonization of Alta California, as manifested in the religious-military mission system, produced profound changes in the cultures of the indigenous population. The missions resettled and concentrated the aboriginal hunter-gatherer population into agricultural communities. The concentration of population, coupled with the indigenous people's lack of immunity to European diseases, caused the tribes to be decimated by common diseases which were generally not fatal to Europeans. It has been estimated that the Ohlone population declined from 10,000 or more in 1770 to less than 2,000 in 1832 (Levy 1978:486).

Jurisdiction over Alta California was established by Mexico in April of 1822. During the Mexican Period (1822-1848), control over this remote area by the central and local Mexican authorities was never strong.

A major factor leading to the disintegration of Mexican control of California was pressure from the United States. Initial contacts were made by private citizens, such as the November 1826 visit by Jedediah Smith to the San Gabriel Mission and the 1832 stop by Ewing Young at Los Angeles. These and other sojourners brought the news of California back to the United States, helping trigger the immigration of U.S. citizens into California. The continued friction between Mexico and the United States ultimately led to the Mexican War of 1846-1847. On July 9, 1846, a crew from the sloop-of-war USS *Portsmouth* came ashore and raised the first American flag over San Francisco (Beck and Haase 1974:47; Hoover et al. 1990:336). However, as Mexico had ceased stationing regular troops in San Francisco following secularization (Hoover et al. 1990:331), the raising of the flag was a symbolic gesture rather than a result of heroic exuberance.

California became part of the United States as a consequence of the U.S. victory over Mexico in the war. The territory was formally ceded in the treaty of Guadelupe Hidalgo in 1848, and was admitted as a state in 1850 (Beck and Haase 1974).

Prior to the discovery of gold at Sutter's Mill on January 24, 1848, development in San Francisco consisted of the Spanish/Mexican facilities (i.e., the Presidio and Mission) and a small settlement known as Yerba Buena situated on the shores of the cove by the same name. The inhabitants of Yerba Buena were predominantly non-Spanish, English-speaking immigrants (e.g., U.S. or British citizens). Sometime before the gold rush, the inhabitants of Yerba Buena officially changed the name of their settlement to San Francisco. Following the discovery of gold, San Francisco transformed rather quickly from an isolated hamlet into a bustling center of commerce (Hoover et al. 1990:334-336; Kemble 1957:7). According to historic accounts cited by Hupman and Chavez (1995:56), after the discovery of gold, the population of San Francisco grew from 375 people in 1847 to 2,000 by February 1849, and by the end of 1849, there may have been as many as 20,000 people living in the city.

The APE includes several areas with distinct historical identities and themes. These include the military reservation and Port of Embarkation at Fort Mason and recreational facilities at Aquatic Park, as well as scattered remnants of industrial facilities that once dominated the area.

Inspired by the booming gold industry in the west, and escaping economic instability at home, throngs of Italian immigrants came to the growing city of San Francisco in the middle of the nineteenth century (Dendero 1950). With backgrounds in agricultural and aquatic industries, Italian Americans soon began to make a significant impact in the local economies. Near the Project APE was the site of the original Italian boat basin which serviced the burgeoning commercial fishing industry. It was relocated in 1902 during reclamation efforts to its present day site of Fisherman's Wharf. By 1910, the Italian fleet at Fisherman's Wharf included over 700 vessels and 2,500 crewmen (Dillon 1985).

One of the most prominent of the Italian immigrants was Dominico (Domingo) Ghirardelli. In 1847, he opened a store which provided general goods and supplies catering to Italian miners (Dillon 1985). His business proved successful and continued to grow. He made a name by selling confections and developing his famous "broma" chocolate for which the company is primarily known. By 1881, his sons had taken to running the family business, and with expansion looming, moved the company into the then vacant Pioneer Woolen Mills located within Black Point Cove (Delgado 1981).

Prior to the Gold Rush, a portion of the eastern end of the APE was completely submerged beneath the waters of San Francisco Bay, since the original shoreline was south of Jefferson Street. The two most prominent features along the shore were Tonquin Point, a tall, sandy dune jutting out into the bay roughly along the line of present-day Hyde Street, and the natural headland at Black Point (now Fort Mason). Between the two was a large curving cove, portions of which were later developed as Aquatic Park.

The Fort Mason area served as a strategic Spanish (1794-1821), then Mexican (1821-1848) military post until California was ceded to the United States in 1848. Black Point was recognized early on for its military potential, and was reserved for use of the military almost immediately after California achieved statehood. Feeling threatened by the settlement boom of the Gold Rush, the U.S. government issued an executive order in 1850, setting aside 10,000 acres of land for military use on the San Francisco peninsula.

After nearly 20 years of inconsistent military use of the original installation, the size was dramatically reduced to its current state. Honoring Colonel Richard Barnes Mason, the post was renamed "Fort Mason" in 1882 (NPS 2004b).

To the east of Black Point, the water depths were considered too shallow for general shipping, but the location did prove attractive for commercial enterprises requiring large volumes of water. Beginning in the 1850s, several businesses located industrial facilities here, notably the Selby Lead and Smelting Company, and the Pioneer Woolen Mills—later purchased by D. Ghirardelli & Company and converted for use as a chocolate factory. Columbus Avenue, a natural pass between Russian Hill and Telegraph Hill, was developed in the 1870s to connect the area with downtown San Francisco.

Development intensified in the early years of the 20th century. In 1900, San Francisco's fishing fleet was relocated from the Union Street Wharf near downtown to its present location. This development coincided with widespread filling activities in the Bay, especially after the 1906 Earthquake and Fire, when thousands of truckloads of rubble and debris were hauled over from Chinatown and North Beach and used to fill areas near Fisherman's Wharf and Aquatic Park.

At the turn of the 20th century, San Francisco's fishing industry was among the busiest on the continent, processing more fish than all the combined ports from Washington State to Mexico. In 1914, the State Harbor Commission constructed two bulkhead wharves for the use of the fishing fleet. Around the same time, the State Belt Line Railroad—San Francisco's waterfront rail system—was extended along Jefferson Street across the cove at Aquatic Park to Fort Mason. At this location, a tunnel beneath the Fort connected the rail line with the Sierra & San Francisco steam plant to the west, as well as recently filled land then being developed for the 1915 Panama Pacific International Exhibition. The extension of the railroad would prove critical during the coming World Wars, when Fort Mason served as a supply depot, and later as a port of embarkation.

The 80 years following 1850 saw Fort Mason undertake various military and civil duties. In the 1890s, upgrading to new weapon technologies, the military installed a series of high-powered artillery at the mouth of the bay. However, Fort Mason's more easterly position rendered it less important for this type of defense and its posts were some of the first to be abandoned. After the 1906 earthquake, the grounds of Fort Mason were used to temporarily house some of the city's displaced inhabitants. Nearly ten years later, these same grounds were adopted by the Panama Pacific International Exposition, which left behind various components of site infrastructure, including the most relevant to this project, an electric streetcar line. World War I and World War II saw some military activity at the Fort; however, with the advent of new transportation technologies, the military importance of the Fort waned. In 1972, Fort Mason was transferred to the National Park Service, and continues to be run by the National Park Service (NPS) today (NPS 2004b).

For the first half of the 20th century, the area east of Fort Mason continued to be dominated by fishing and industrial production, although changes were on the way. In the 1930s, Fisherman's Wharf was divided into three basins, followed closely by the development of the Aquatic Park Bathhouse and associated facilities. Aquatic Park was one of the largest Works Progress Administration (WPA) projects, and was largely completed between 1936 and 1939. Aquatic Park, a formal designed landscape, encompassed several buildings and structures including: the Bathhouse with flanking

amphitheater structures, two speaker towers, Convenience Stations, one with a concessions stand, a Seawall, the Promenade, and Municipal Pier. The most notable building on the site, the Bathhouse, is a Streamline Moderne masterpiece with highly significant interior spaces. This building marked a long tradition of water recreation in the area. At least as early as the 1880s, bathers congregated in the cove to enjoy its warm waters—the result of heated industrial discharge from nearby facilities such as the Pioneer Woolen Mills. Aquatic Park eventually became known for several accomplishments, including: the first formal Senior Citizens Center; the grandiose Works Progress Administration projects, which encompassed construction, architectural styling, and artwork in the various buildings and structures; its extensive and noteworthy social work programs developed in California during the Depression; as the headquarters of the Anti- Aircraft Defense of the Pacific Coast; and as a locally-significant example of community planning. In the late 1940s, the military uses of Aquatic Park departed for a nearby site, thus relegating Aquatic Park to its recreational uses. In 1951 the Aquatic Park Bathhouse Building, already home to the San Francisco Senior Center, became home to the San Francisco Maritime Museum.

One byproduct of the increased development in the area came in the form of restaurants, which in the 1930s began to relocate to Fisherman's Wharf both for access to fresh fish and to take advantage of the colorful scenery. By the 1950s—the same time that many west coast fisheries began to decline in earnest—many fishing operations at the Wharf likewise became increasingly focused on the steadier and more lucrative opportunities offered by the restaurant and tourist trade. This trend intensified in the latter half of the century, with fishing and industrial production steadily giving way to businesses focused on tourism. In the 1960s, both the Ghirardelli chocolate factory and the California Fruit Canners Association Cannery (now known as the Cannery) were redeveloped as shopping complexes. Nearby, the Hyde Street ferry terminal became the site of a maritime state park in the late 1950s, and then, along with Aquatic Park, became the heart of the San Francisco Maritime National Historical Park in 1988. Within a few years the warehouses, boat building shops, lumber and rail yards that had once been common were being rapidly replaced with hotels, restaurants and other commercial businesses. Fort Mason ceased to function as a military facility and became part of the Golden Gate National Recreation Area in 1972. Today the Fisherman's Wharf area is considered the center of tourist activities in San Francisco.

3.7.4 Regulations and Policies

Numerous federal laws, statutes, and regulations have been enacted to protect the country's cultural heritage. The most applicable regulations to the proposed undertaking are summarized below.

American Antiquities Act (1906). The federal government formally recognized the importance of cultural resources with passage of the American Antiquities Act of 1906 (16 United States Code (USC) 431-433). This act, with its implementing regulation 43 Code of Federal Regulations (CFR) Part 3, protects historic and prehistoric resources on federal lands and prohibits excavation or destruction of cultural resources. Jurisdiction over resources on federal lands is given to the respective Department with authority on those lands. The Act also authorizes the President to declare areas of public lands as National Monuments and to reserve or accept private lands for that purpose.

Historic Sites Act, as amended (1935). The Historic Sites Act (16 U.S.C. 461-467) established the National Historic Landmark program for historic and archeological sites, buildings, and objects of national significance. The Act directs the National Park Service, on behalf of the Secretary of the Interior, to evaluate, acquire, restore/maintain, and manage such properties for the benefit of the public, and to identify them with a tablet to "commemorate historic or prehistoric places and events of national historical or archeological significance." The NPS Advisory Board and NPS Advisory Council are also established by this Act.

National Historic Preservation Act, as amended (1966). Cultural resources are protected through the NHPA of 1966, as amended (16 U.S.C. 470 et seq.), and its implementing regulation, Protection of Historic Properties (36 CFR Part 800). Under the NHPA, a cultural resource is considered significant if it meets the Criteria for Evaluation (36 CFR 60) for the National Register of Historic Places (NRHP, National Register).

Prior to implementing an "undertaking" (i.e., "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval"), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) a reasonable opportunity to comment on any undertaking that would potentially affect properties listed or eligible for listing in the National Register. The lead federal agency is responsible for Project compliance with Section 106 of the NHPA.

The NHPA also provides heightened protection for designated National Historic Landmarks (NHLs) through Section 110(f) and the NHPA's implementing regulations (36 CFR 800.10). National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. Specifically, the NHPA requires that Federal Agencies shall, to the maximum extent possible, "undertake planning and actions necessary to minimize harm to any NHL that may be directly and adversely affected by an undertaking."

National Register of Historic Places. The National Register was established by the NHPA of 1966, as "an authoritative guide to be used by federal, state, and local governments, private groups and citizens to identify the Nation's historic resources and to indicate what properties should be considered for protection from destruction or impairment" (36 CFR 60.2). The National Register recognizes both historic and prehistoric properties that are significant at the national, state, and local levels.

To be eligible for listing in the National Register, a resource must be significant in American history, architecture, archeology, engineering, or culture. As indicated in Section 101(d)(6)(A) of the NHPA, properties of traditional religious and cultural importance to an Indian tribe are eligible for inclusion in the National Register. Districts, sites, buildings, structures, and objects of potential significance must meet one or more of the following four established criteria (36 CFR 60.4):

A. Are associated with events that have made a significant contribution to the broad patterns of our history;

B. Are associated with the lives of persons significant in our past;

C. Embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Have yielded, or may be likely to yield, information important in prehistory or history.

Unless the property possesses exceptional significance, it must be at least 50 years old to be eligible for National Register listing (36 CFR 60.4).

In addition to meeting the criteria of significance, a property must have integrity, meaning the ability of a property to convey its significance. The National Register recognizes seven qualities that, in various combinations, define integrity. To retain historic integrity a property must possess several of these seven aspects. Thus, the retention of the specific aspects of integrity is paramount for a property to convey its significance. The seven factors that define integrity are location, design, setting, materials, workmanship, feeling, and association (36 CFR 60.4).

Archeological and Historic Preservation Act, as amended (1974). The Archeological and Historic Preservation Act (AHPA) (16 USC 469-469c) requires that federal agencies provide for the preservation or recovery of important scientific, historical, or archeological data that may be destroyed as a result of federal undertakings, or through federal funding or licensing of projects. Emergency projects, such as those related to a natural disaster, are exempt from compliance with AHPA if implementation of AHPA would impede the project.

American Indian Religious Freedom Act (1978). The American Indian Religious Freedom Act (codified at 42 USC 1996, et seq. and regulated under 43 CFR 7) protects the right of American Indians, Eskimos, Aleuts, and Native Hawaiians to practice and express their traditional religious beliefs and ceremonies. It also insures their access to sacred sites, as well as the use and possession of sacred objects. The act further directs federal entities to evaluate their policies and procedures in consultation with Native American traditional religious leaders to determine changes necessary to protect and preserve Native American cultural and religious practices.

Archeological Resources Protection Act (1979). The Archeological Resources Protection Act (ARPA) was enacted primarily to better protect archeological resources and to increase scientific knowledge of archeological resources. ARPA provides for federal permitting of scientific investigation of archeological resources, substantial penalties for unauthorized removal, desecration or trafficking of archeological resources, increased public awareness of the importance of archeological resources, and for enhanced management of archeological resources. ARPA also encourages communication and interaction between professional and avocational archeologists.

Native American Graves Protection and Repatriation Act (1990). The Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.) provides for the protection and return of Native American and Native Hawaiian human remains, funerary objects, sacred objects, and objects of cultural patrimony, and establishes ownership hierarchy for human remains and associated artifacts found on federal lands. NAGPRA also sets penalties for violations of the act, calls for cultural resource inventories of federal agency holdings and federally-funded repositories, and contains

provisions for the return of specified cultural items to the appropriate Native American tribe(s) and/or Native Hawaiian organization(s). NAGPRA is initiated when the project and the finds are situated on federal lands.

Abandoned Shipwreck Act (1987). The Abandoned Shipwreck Act (43 USC 2101–210), is a federal-level legislative act but it does protect shipwrecks found in state waters. The Abandoned Shipwreck Act also states that the laws of salvage and finds do not apply to abandoned shipwrecks protected by the act.

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5.3.5 Treatment of Cultural Resources. The Park Service will provide for the long-term preservation of, public access to, and appreciation of the features, materials, and qualities contributing to the significance of cultural resources. With some differences by type, cultural resources are subject to several basic treatments, including (1) preservation in their existing states; (2) rehabilitation to serve contemporary uses, consistent with their integrity and character; and (3) restoration to earlier appearances by the removal of later additions and replacement of missing elements.

5.3.5.1 Archeological Resources. Archeological resources will be managed in situ, unless the removal of artifacts or physical disturbance is justified by research, consultation, preservation, protection, or interpretive requirements. Preservation treatments will include proactive measures that protect resources from vandalism and looting, and will maintain or improve their condition by limiting damage due to natural and human agents

5.3.5.2 Cultural Landscapes. Treatment decisions will be based on a cultural landscape's historical significance over time, existing conditions, and use. Treatment decisions will consider both the natural and built characteristics and features of a landscape, the dynamics inherent in natural processes and continued use, and the concerns of traditionally associated peoples. The treatment implemented will be based on sound preservation practices to enable long-term preservation of a resource's historic features, qualities, and materials. There are three types of treatment for extant cultural landscapes: preservation, rehabilitation, and restoration.

3.7.5 Known Resources in the APE

The identification of cultural resources was conducted between 2007 and 2009 by Page & Turnbull and URS Corporation. Identification of resources included archival research and intensive-level field surveys. The findings of these efforts are described below. The findings are divided into the topical subjects of historic structures, archeological resources, and cultural landscapes.

Historic Structures. Identification of historic structures included archival research and field surveys completed by Page & Turnbull from 2007 to 2009.

As a result of the archival research completed by Page & Turnbull, seven properties listed in the National Register of Historic Places were identified within the APE (see **Table 3.7-1**). These listed resources are identified in Figure 3.7-1. A brief description of each resource is provided below.

TABLE 3.7-1: PROPERTIES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES

	Name	Listing
1	Aquatic Park National Historic Landmark District (#84001183)	National Register-listed (January 26, 1984), National Historic Landmark (May 28, 1987)
2	San Francisco Port of Embarkation U.S. Army National Historic Landmark District (#85002433)	National Historic Landmark (February 4, 1985), National Register-listed
3	Fort Mason National Register Historic District (#72000109); Boundary Increase #79000350	National Register-listed (April 25, 1972); Boundary Increase National Register-listed April 23, 1979
4	California Fruit Canners Association (Haslett) Warehouse, 680 Beach Street (#75000172)	National Register-listed (March 28, 1975)
5	Pioneer Woolen Mills & D. Ghirardelli Company, 900 North Point Street (#82002249)	National Register-listed (April 29, 1982)
6	San Francisco Cable Cars, 1390 Washington Street (#66000233]3)	National Historic Landmark, National Register-listed (October 15, 1966)
7	Pumping Station #2, San Francisco Fire Department Auxiliary Water Supply System (#76000177)	National Register-listed (May 13, 1976)

Aquatic Park National Historic Landmark District. The Aquatic Park District is listed as a National Historic Landmark as "…one of California's largest Works Progress Administration (WPA) projects reflecting President Franklin D. Roosevelt's policy of providing employment to architects and artists during the Great Depression." It is significant within the areas of architecture, community planning and development, art, and military, and is particularly noteworthy for its Streamline Moderne architectural style, and its associations with Frederick Law Olmsted and Daniel Hudson Burnham. The Aquatic Park NHL District contains ten acres of land with three building and five structures, which are significant for the period from 1920-1945. The Aquatic Park National Register Historic District was extended to the west side of Van Ness Avenue through concurrence determination of eligibility with SHPO in August 2004, so that the National Register-listed district coincides with the Cultural Landscape. Aquatic Park is located within the San Francisco Maritime National Historical Park.

San Francisco Port of Embarkation. The San Francisco Port of Embarkation, U.S. Army Historic District is listed as a National Historic Landmark for its association with World War II in which it was defined as the principal port on the West Coast for delivering personnel, material, weapons, and ammunition to the military campaigns in the Pacific Rim. It is significant within the area of military for the period from 1912 to 1945. It is a discontiguous district, containing 21 acres, 13 buildings, and 5 structures in Lower Fort Mason, and Headquarters building 201 in Upper Fort Mason. The Port of Embarkation NHL District is contained within the Fort Mason National Register Historic District, which is in turn located within the Golden Gate National Recreation Area.

Fort Mason National Register Historic District. The Fort Mason Historic District is listed in the National Register of Historic Places for its associations with California military governor Colonel Richard B. Mason (Criterion B) and early Spanish and Western American military history

(Criterion A). This district possesses some of the oldest buildings in San Francisco. Specifically, this district is significant within the areas of military for the specific date of 1797, and the period from 1850 to 1859. Also known as Black Point, Bateria San Jose and Punta Medanos, the historic district was enlarged in 1979. The Fort Mason Historic District (Boundary Increase) is listed in the National Register of Historic Places under Criterion A (Events) and Criterion C (Design/Construction) for its association with early Spanish and Western American military history and as a strong collection of military structures that illustrate the evolution of an Army post from the 1850s to the 1950s. This historic district is significant within the areas of architecture, military, transportation, and landscape architecture for the periods from 1855 to 1953. The historic district encompasses 68.5 acres with 45 buildings, ten structures, and two objects.

California Fruit Canners Association (Haslett) Warehouse. The Haslett Warehouse is listed in the National Register of Historic Places under Criterion A (Events) for its association with the California Fruit Canners Association, and under Criterion C (Design/Construction) as an example of the warehouses that once dominated the northern waterfront of San Francisco. The building was originally designed by William S. Mooser, Jr., who also completed nearby projects, including D. Ghirardelli Company and the Cannery, and who also worked on the Aquatic Park Bathhouse. It is significant within the areas of architecture, commerce, industry, and urban planning for the period from 1907 to 1909. Recently, the Haslett Warehouse was adaptively rehabilitated and now houses the Argonaut Hotel and the San Francisco Maritime NHP Visitor Center, as well as the NPS Pacific West Information Center.

Pioneer Woolen Mills & D. Ghirardelli Company. The Pioneer Woolen Mills & D. Ghirardelli Company is listed in the National Register of Historic Places under Criterion A (Events) for its association with the Pioneer Woolen Mills and D. Ghirardelli Company and under Criterion C Design/Construction) as the "prototype of commercial adaptive re-use." Also known as Ghirardelli Square, the complex has three distinct phases of development: Pioneer Woolen Mills (1858-1889) designed by William S. Mooser, Sr., D. Ghirardelli Company (1892-1962-67) designed by William S. Mooser, Jr., and Ghirardelli Square (1962-1982) designed by architects Wurster, Bernardi & Emmons, design consultant John Mattias, and landscape architect Lawrence Halprin. The complex is significant within the areas of architecture, commerce, conservation, industry, landscape architecture, sculpture, adaptive reuse, and urban mall marketplace for the period from 1861 to 1923, and 1962 to 1968.

San Francisco Cable Cars. The San Francisco Cable Cars are listed as National Historic Landmarks as the only cable cars still operating in an American city. Designated as a structure, the San Francisco Cable Cars are significant within the area of transportation for the period from 1850 to 1899. In addition to the cars themselves, the designated Landmark includes approximately ten miles of track and cable on eight different streets, the building at Washington and Mason Streets which serves as both the power house and the car-barn, and the turntable mechanisms located at the ends of the various lines of track. There are three extant cable car routes: Powell-Mason, Powell-Hyde, and the California lines. The cable car line running from the Powell/Market turntable to the turntable at the northwest corner of Beach and Hyde streets intersects into a portion of the APE.

Pumping Station #2. Pumping Station #2 of the San Francisco Fire Department Auxiliary Water Supply System is listed in the National Register of Historic Places under Criterion C

(Design/Construction) as an example of an innovatively planned and designed "earthquake proof" fire fighting system for San Francisco. Only that portion of the system located on federal land, Pumping Station #2, is included in the nomination. The pumping station is significant within the areas of community planning and engineering for the period from 1912 to 1975.

In addition to the seven historic properties that were previously documented, there were 37 additional buildings and structures within the APE but on city land and outside NPS boundaries that were surveyed for their potential historic significance; none were found eligible for inclusion in the National Register. However, four of the documented buildings were found eligible for the California Register of Historic Resources. A report describing the findings of the historic building inventory was completed by Page & Turnbull in 2009. These potential CRHR resources were also recorded on California Department of Parks and Recreation (DPR) inventory forms; the forms are appended to the 2009 report.

Archeological Resources. Identification of archeological resources included archival research and surveys by URS Corporation (URS 2009d) and Holman & Associates (Holman & Associates 2010).

As a result of the archival research, a total of four recorded indigenous archeological resources were identified within the Project APE, including two recorded at least partially within areas that would potentially be affected by ground-disturbing construction activities associated with the historic streetcar line extension. Two of the archeological sites (CA-SFr-30 and CA-SFr-31) are not located within any portion of the APE that would be affected by subsurface disturbances during construction. CA-SFr-23 and CA-SFr-29 are believed to be located at least partially within areas that may be disturbed by Project construction. The exact boundaries of these sites in relation to areas proposed for subsurface disturbance are unknown.

CA-SFr-23 is an indigenous site and was last recorded in 1954. According to the site survey record, the site information is taken from an 1861 publication titled "The Indianology of California" (Davis 1954). The site was described as a "circular fire-burnt spot on the bare place at the summit of a sandy cliff 40' high, with quantities of decayed fish-bone and crushed shells mixed with sand." In addition, the 1954 site record also states that the site was destroyed in 1861. It is unclear whether the recorder was able to, or attempted to, relocate the site in 1954 (URS 2009d).

After the results of the record search were analyzed, an intensive pedestrian survey of the Project APE was conducted by URS Corporation (URS 2009d). Despite efforts to locate areas of native soil, ground visibility over the majority of the Project APE was essentially non-existent. In addition, an attempt was made to relocate previously recorded sites within the APE. No evidence of CA-SFr-23 was encountered during the survey effort. In addition, the field survey yielded no new archeological resource discoveries (URS 2009d).

Additional archeological testing for site CA-SFr-23 was not conducted because of the dubious existence of the site based on existing documentation and the amount of historic disturbance and infrastructure changes that have occurred in the reported site location. It was not considered prudent to conduct subsurface testing in this environment.

An additional archeological investigation was completed by Holman & Associates, Archaeological Consultants, on July 27-28, 2010, to document the boundaries of CA-SFR-29, a shellmidden that was originally identified in 1978. Site CA-SFR-29 was recorded in the western edge of Fort Mason's Great Meadow, within the APE. The Holman & Associates investigation was completed to determine if the site extended into areas of proposed improvements for the South Loop Alternative. Holman & Associates conducted a limited exploration of 31 auger corings. One auger core in the eastern part of the investigation area revealed a dark brown sandy layer containing fragments of bent nose clam (*Macoma nasuta*) shells, consistent with the original field observations for CA-SFr-29. No archeological deposits were identified within the areas of proposed improvements for the South Loop Alternative (Holman & Associates 2010).

Cultural Landscapes. A Cultural Landscape Report (CLR) is the primary report that documents the history, significance and treatment of a cultural landscape. A CLR evaluates the history and integrity of the landscape including any changes to its geographical context, features, materials, and use.

Cultural Landscape Report, Aquatic Park (NPS 2010b). The National Park Service has prepared a cultural landscape report (CLR) for Aquatic Park (NPS 2010b). According to the report, "Aquatic Park is a historic designed landscape located on the San Francisco Waterfront, immediately west of Fisherman's Wharf. The park is within the San Francisco Maritime National Historical Park and has a rich association with maritime history, community and park planning, and the Works Progress Administration. For over a century Aquatic Park has been a popular public recreation area and waterfront park.

The designed landscape of Aquatic Park includes historic circulation systems, open spaces, planted areas, and several significant structures including piers, retaining walls, unique outbuildings, and the Streamline Moderne Bathhouse. In 1984, Aquatic Park was listed in the National Register of Historic Places and three years later, in recognition of its national significance, the park was designated a National Historic Landmark (NHL). The period of significance for the historic district is between 1920, when initial construction of the park began, through 1945, marking the end of World War II and military use of the site" (NPS 2010b).

The Aquatic Park CLR includes the entire NHL District, plus a small strip of land on the west side of Van Ness Avenue known as the "Pocket Park." Contributing features to the Aquatic Park cultural landscape relevant to the proposed action include the Bathhouse, the West Bleachers, the West Convenience Station, the West Speaker Tower, the stone retaining wall near the Bocce Ball Courts, the Promenade Retaining Wall, the State Belt Railroad Tracks, and the paved walkway system from Van Ness Avenue past the West Speaker Tower. Non-contributing elements include the Bocce Ball Courts and Victorian Park, both of which were developed after the park's period of significance.

The treatment recommendations detailed in the CLR that are relevant to the proposed action include the following: "Ensure that any future park development affecting the historic character of the stone retaining wall (such as development of historic streetcar tracks and a stop in this area) is considered and evaluated within the context of the historic designed landscape and potential affects [sic] to the NHL district. Assess potential adverse effects of new park development affecting the historic design of

the stone retaining wall, and develop appropriate mitigation measures in consultation with a historical landscape architect and/or cultural resource staff" (NPS 2010b:114-115).

Cultural Landscape Report for Fort Mason Golden Gate National Recreation Area – Volume One: Site History, Existing Conditions, and Analysis (NPS 2004b). Volume One of the Cultural Landscape Report for Fort Mason GGNRA comprises a historical context, an inventory of existing conditions, and an analytical examination of the landscape and its features according to the National Register of Historic Places criteria and definitions. Contributing features to the Fort Mason cultural landscape relevant to the proposed action include the East and West Portals to the tunnel beneath Fort Mason, the tunnel itself, the railroad tracks in the Fort Mason parking lot and within the tunnel, the Lower Fort Mason entry gate and guard station, Piers 1-3 and Sheds 1-3, storehouses A-D, the fire station, and the entire Port of Embarkation cultural landscape. The Great Meadow, created in 1982, is a non-contributing feature of the Fort Mason cultural landscape, although the Specimen Trees located in a landscaped area west of the Great Meadow are contributing natural features.

Cultural Landscape Report Part II: Treatment. Fort Mason Center (NPS 2009). This CLR for Fort Mason Center contains treatment guidelines for the contributory cultural landscape features of the FMC identified in the 2004 study. The treatment guidelines and recommendations are organized by landscape characteristics and range from broad conceptual goals for the site that would follow established planning processes to finely detailed suggestions for improvement.

This CLR contains treatment recommendations that address the proposed extension of the historic streetcar line to Fort Mason, and identifies the opportunities and constraints of both turnaround loop options, expressed as consistencies or inconsistencies with the overall FMC "treatment philosophy," or guiding preferences. The overall FMC treatment philosophy is identified as *Rehabilitation,* consistent with the Secretary of the Interior's Standards for Rehabilitation.[3] The report notes that, "Both [turnaround loop] alternatives … have aspects that are consistent and inconsistent with treatment philosophy for the FMC landscape" (NPS 2009:90) The report describes the following about the two turnaround loop options:

Option A [north turnaround Loop] Consistencies with Treatment Philosophy

- Reintroduces historic rail use through the tunnel and within the boundaries of FMC.
- Intensifies public access, increasing pedestrian activity in Lower Fort Mason and arrival via public transportation.
- Improves the visitor experience.

Option A [north turnaround Loop] Inconsistencies with Treatment Philosophy

- Introduces another "access" point to Lower Fort Mason, diminishing one of its significant features as a historic military site – controlled access.

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[3] The Secretary of the Interior's Standards define Rehabilitation as "the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values."

- Alters a contributing landscape feature – the retaining wall. The wall would be altered at a point lower than its highest point, which is preferable than at another more focal location.
- May aggravate existing pedestrian and vehicle confusion and orientation near historic entry point.
- As currently designed, the proposed rail tracks do not follow historic patterns, and in some cases interrupt the historic rail track system. If this option is pursued, it is strongly recommended that the alignment of the proposed rail tracks be redesigned, so historic rail circulation routes are left intact and emphasized as having primary significance. Reusing the historic rail alignments should be considered if the track gauges are the same. If not, new track layouts should be designed to minimize the loss of historic rail tracks. New construction such as platforms, waiting areas, and operators' restrooms should be designed following guidelines in this report. Consider accommodating operator's restroom in an existing building rather than constructing dedicated new building.

Option B [south turnaround loop] Consistencies with Treatment Philosophy

- Reintroduces historic rail use through the tunnel.
- Major alterations occur within the Great Meadow, an area much altered in the past.
- Little impact to above-ground historic resources.

Option B [south turnaround loop] Inconsistencies with Treatment Philosophy

- Does not reintroduce historic rail use within the boundaries of FMC.
- Does not result in the same increased foot traffic to FMC.

3.8 RECREATION AND VISITOR USE

3.8.1 Introduction

San Francisco's northern waterfront is emerging as a key recreational and cultural corridor within the Bay Area. Annually, millions of visitors come to the area's many facilities, including the Ferry Building, tourist attractions at Pier 39, Fisherman's Wharf, San Francisco Maritime National Historical Park (NHP), Municipal Pier, Golden Gate National Recreation Area's (GGNRA) headquarters, and Fort Mason, where the Fort Mason Center is located. Of these recreational opportunities, only those located on the proposed route are expected to be affected and are discussed below.

3.8.2 Key Recreational Opportunities in Project Area

Fisherman's Wharf. Fisherman's Wharf describes a tourist district in San Francisco, roughly encompassing the northern waterfront from Van Ness Avenue east, to Pier 35 or Kearny Street. Several historic public transportation lines service the area including the F Market streetcar, the Powell-Hyde cable car line, and the Powell-Mason cable car line. It is best known for being the location of Pier 39, San Francisco Maritime National Historical Park, the Cannery Shopping Center, Ghirardelli Square, a Ripley's Believe it or Not museum, the Musée Mécanique, the Wax Museum at Fisherman's Wharf, Forbes Island, and restaurants and stands that serve fresh seafood. Other attractions in the Fisherman's Wharf area are the Hyde Street Pier, the USS Pampanito, a decommissioned World War II era submarine, and the Balclutha, a 19th century whaling ship. Some of these attractions are discussed in greater detail below.

Fort Mason. Fort Mason is a formal military post and port of embarkation, in use until the 1960s. Fort Mason consists of Upper and Lower Fort Mason. Upper Fort Mason is at a higher elevation, and includes the Great Meadow and the headquarters of the GGNRA. Lower Fort Mason houses the administrative offices of SF Maritime NHP, including the headquarters offices, library and collections and the Fort Mason Center. By 1972, Fort Mason, along with other Bay Area military outposts, became the GGNRA, an urban park within the National Park Service system. Upper Fort Mason now hosts a youth hostel, hiking and biking trails, open space parks and gardens, beaches, a cultural center and historic buildings. The largest open space area within Fort Mason is the Great Meadow, which is a popular spot to sit on the grass, walk, or fly kites, among other recreational opportunities. A path follows the harbor edge, rising along the headland and offering views north past Alcatraz and east to the Golden Gate Bridge. Fort Mason Center (lower Fort Mason), is devoted to events, programs and organizations that support and reflect the culture of San Francisco.

The San Francisco Maritime National Historical Park. This park was acquired in 1978 and includes a fleet of historic vessels, a visitor center, man-made lagoon, parks, a maritime museum, and a library/research facility, among other things.

The San Francisco Maritime Museum is a Streamline Moderne (late Art Deco) building that is the key structure of the Aquatic Park National Historic Landmark District. It is a four-story reinforced concrete structure designed by William Mooser, Senior and Junior. It is oval in plan, and its clean

nautical lines and stepped levels evoke images of a ship. A Works Progress Administration (WPA) report stated: ‘like a huge ship at its dock…with rounded ends, set back upper stories, porthole windows and ship rails, its resemblance to a luxurious ocean liner is indeed startling.’ Built as a bathhouse for 5,000 people, ‘a Palace for the Public’ in the mid- to late-1930s, its interior is decorated with fantastic and colorful murals (WPA fact sheet). The second, third, and fourth floors are used for exhibit space.

North of the Maritime Museum is a man-made lagoon on the site of the former Black Point Cove used for swimming and boating. To the west is the horseshoe shaped Municipal Pier. The lagoon is fronted by a sandy beach and a stepped concrete seawall. To the south is a grassy area known as Victorian Park which contains the Hyde Street cable car turnaround. This park is used for sitting, sunbathing, picnicking, enjoying the water views, lawn games, dog exercising, and school groups. Nearby, there are Bocce Ball Courts at Beach Street and Van Ness Avenue. Formerly the site of the Black Point Pumping Station, this vacant lot was informally used as a gathering area for local bocce ball players as early as 1947. In 1960, the City of San Francisco constructed courts, wood retaining wall, overhead structure and a raised planting bed and in 1994 the roof on the overhead structure was replaced and a planting bed along the east side of the courts was added (NPS 2010b). Today there is space for five courts; two of which are under a protective roof. The three uncovered courts are used for the original form of bocce, played with bronze balls. There is also a clubhouse that is used to store bocce balls and other equipment. There are approximately 50 members of the private Aquatic Park Bocce Ball Club; however the courts are open to the public. The courts are used almost daily by approximately 2-50 people. The courts are used by summer camps, the Special Olympics, and a variety of other tournaments (Tosi 2010).

The Hyde Street Pier is an historic ferry pier and creates the eastern boundary of the lagoon. Various historical ships are anchored to the pier, some available for self-guided or docent-led tours. Among the ships on display or in storage are the *Balclutha*, an 1886 square rigged sailing ship, as well as *C.A. Thayer* NHL, *Eureka* NHL, *Alma* NHL, *Hercules* NHL, *Eppleton Hall*, and several smaller craft.

The park also incorporates the Aquatic Park Historic District NHL, bounded by Van Ness Avenue, Beach Street, and Hyde Street. This district is a complex of buildings within a designated landscape on the San Francisco Bay waterfront. The District includes the bathhouse and stadia, Municipal Pier, two speaker towers, two convenience stations, one with a concessions stand (now used as storage), sea wall, promenade, the beach, the lagoon, paths, retaining walls and historic plantings.

The grassy areas of Aquatic Park are used for sitting, sunbathing, picnicking, and enjoying the water views. Ghirardelli Square is located at 900 North Point Street at the corner of Beach and Larkin Streets, one block west of the Cable Car turnaround at Beach and Hyde streets. Ghirardelli Square was the historic headquarters of the Ghirardelli Chocolate Company, but after the company was sold and moved off site, the buildings were purchased and converted into a center for shops and restaurants. Since this time, the area has become a landmark and attraction for locals and tourists. In 1982, a portion of the area was listed on the National Register of Historic Places.

The San Francisco Bay Trail is a planned recreational corridor to ring the San Francisco and San Pablo bays with a 500-mile network of bicycling and hiking trails. The Bay Trail Plan was adopted by the

Association of Bay Area Governments (ABAG) in 1989, and to date, 290 miles of the trail have been completed. The Bay Trail provides easily accessible recreational opportunities for outdoor enthusiasts, including hikers, joggers, bicyclists, and skaters. It also offers a setting for wildlife viewing and environmental education, and it increases public appreciation for the Bay.

A portion of this trail is contained within the Project Area, as is shown in Figures 1-2 and 1-3. From east to west, the Bay Trail follows Jefferson Street until it ends at Hyde Street. The trail then follows a path along the northern edge of Victorian Park and joins with the path along the waters edge at Black Point Cove. Near the western speaker tower in the San Francisco Maritime NHP, the trail veers southwest from the water's edge along the old railroad tracks and joins with northern VanNess Avenue. Before the Municipal Pier, the Bay Trail heads west along the coast line and merges into the northern-most trail of the Great Meadow along the bluff. At Laguna Street, the trail follows the sidewalk north for a short distance, crosses the Fort Mason parking lot, and follows the paved pathway west, adjacent to the yacht club.

3.8.3 Visitor Use in the Project Area

The average recreational visitors to the Fort Mason area appear to be a mix of San Franciscans and local Bay Area residents, with a smaller subset of visitors from other areas including international tourists. The Fort Mason Intercept Survey was conducted for three days in August of 2007. Seventy percent of respondents identified themselves as Bay Area residents. When asked to report their residential zip code, the majority of surveyed users reported a zip code in San Francisco. Others reported Daly City, Pacifica, cities within Marin County, San Mateo, Berkeley, and Oakland with a measurable frequency. During the survey 9,593 persons were encountered entering the Fort Mason Center. Over half of all users to the center walked as their primary mode of access. The automobile was the second most heavily used access mode, used by nearly 39 percent of the total users. Bike and other modes formed the remaining 3.5 percent of access. Nearly a third of all respondents were at Fort Mason to attend a one-time event, 18 percent were attending a class at Fort Mason Center and 13 percent were there to dine (Wilbur Smith 2007b).

As described in Chapter 1. Purpose and Need for Action, the Fort Mason Center is a destination for many visitors to the GGNRA. The Center hosted more than 11,400[1] events in fiscal year 2009 (October 2008-September 2009), bringing approximately 1.7 million visitors to the site (FMC 2009a). Many events at Fort Mason Center are attended by thousands of visitors, with the largest single event attended by 8,000 visitors (see Appendix A1) for a complete list of the major events in 2010). Other events in the area that impact the Fort Mason Center such as the Bridge to Bridge Run bring over 10,000 visitors to the area.

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[1] Events include classes, meetings, conferences, exhibitions and performances; many occur simultaneously each day.

3.8.4 Regulations and Policies

Federal Guidelines

United States Department of Transportation (USDOT) Act of 1966 – set forth in Title 49 United States Code (U.S.C.), Section 303 provides protection to certain publicly used lands and historic sites. Under Section 4(f) of this code, the USDOT shall not approve a program or project which requires the use of any publicly owned public park, recreation area, or wildlife or waterfowl refuge, or a site of any land from an historic site of national, state, or local significant unless:

- There is no feasible and prudent alternative to the use, and
- All possible planning to minimize harm resulting from such use is included.

A specific Section 4(f) evaluation is not being developed at this time, however this document contains all elements necessary to produce a Section 4(f) evaluation by the Federal Transit Administration, under USDOT, if future funding and/or responsibilities requires such an action, for the project.

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Visitor Use. Enjoyment of park resources and values by the people of the United States is par of the fundamental purpose of all parks. The Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks, and the Service will maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of American society. However, many forms of recreation enjoyed by the public do not require a national park setting and are more appropriate to other venues. The Service will therefore:

- Provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks;

- Defer to local, state, tribal, and other federal agencies; private industry; and nongovernmental organizations to meet the broader spectrum of recreational needs and demands

Recreation. The range of recreational activities that take place in parks include, but are not limited to boating, camping, bicycling, fishing, hiking, horseback riding and packing, outdoors sports, picnicking, swimming, etc.... Many of these activities support the federal policy of promoting the health and personal fitness of the general public, as set forth in Executive Order 13266. However, not all of these activities will be appropriate or allowable in all parks; that determination must be made on the basis of park-specific planning.

Local Guidelines

City of San Francisco General Plan (1996) – Recreation and Open Space Element. The Recreation and Open Space Element concerns the conservation and preservation of opens space, parks and recreational areas within San Francisco. The following policies are applicable to the proposed project.

- **Policy 1.3** – Increase the accessibility of regional parks by locating new parks near population centers, establishing low user costs, improving public transit service to parks and creating regional bike and hiking trails.

- **Policy 2.2** – Preserve existing public open space.

Northwestern Shoreline Plan (1992). The Northwestern Shoreline plan concerns the preservation and enhancement of San Francisco's Northwestern Shoreline from Lincoln Park to Fort Mason. The following objective applies to the proposed project.

> *Fort Mason (GGNRA).* Protect natural vegetation and marine wildlife habitat at the northeast portion of the site. Maintain the existing cultural center in renovated pier and warehouse structures, and use for educational and cultural facilities and activities. Encourage continued programming of special events and activities. Introduce landscaping in parking area. Develop the Burton Memorial amphitheater. Preserve historic gardens and adapt historic buildings to community uses as current use is discontinued and structures are made available by the U.S. Army.

Northeastern Waterfront Plan (1998). The Northeastern Waterfront Plan recommends objectives and policies designed to contribute to the waterfront's environmental quality, enhance the economic vitality of the Port and the City, preserve the unique maritime character, and provide for the maximum feasible visual and physical access to and along the Bay.[2] Within the project area, everything east of the boundary of San Francisco Maritime National Historical Park (Hyde Street) falls within the jurisdiction of the Northeastern Waterfront Plan. The following policy is applicable to the project study area.

- **Policy 7.3** – Connect the recreation and open space facilities of the Northeastern Waterfront with those of the Golden Gate National Recreation Area.[3]

Van Ness Avenue Plan (1995). The Van Ness Avenue Plan provides guidance and direction on physical arrangement of development along the Van Ness corridor. The Van Ness Area Plan was adopted in 1995. Of the three sub-areas identified along the Van Ness corridor, Sub-area 3, which encompasses the portion of Van Ness Avenue between Bay Street and Beach Street, pertains to the study area. The following policy is applicable to the project study area.

- **Policy 3.2** – Support National Park Service plans for improvements of the area within the boundaries of the Golden Gate National Recreation Area (GGNRA).[4]

The study area includes parks and recreational areas and facilities as presented in **Table 3.8-1**. A description of the parks and associated facilities is provided after the table.

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[2] San Francisco Northeastern Waterfront Plan, Adopted 1998.

[3] For the purposes of the Northeastern Waterfront Plan, Policy 7.3 actually refers to connecting the facilities of the Northeastern Waterfront with those of the San Francisco Maritime National Historical Park (Aquatic Park), not the GGNRA.

[4] For the purposes of the Northeastern Waterfront Plan, Policy 3.2 actually refers to improvements within the boundaries of San Francisco Maritime National Historical Park.

TABLE 3.8-1: DESCRIPTION OF PARKS AND RECREATIONAL FACILITIES IN AND NEAR THE STUDY AREA

Facility	Address	Jurisdiction	Activity
Facility Within the Study Area			
Fort Mason Center at Golden Gate National Recreation Area	Laguna/Beach	National Park Service	This area includes the following facilities and services: community gardens, picnic areas, fitness areas, grassy fields, visitor's center, fishing piers, youth hostel, theater, café, exhibits, fairs, lectures, festivals, performances, symposia, classes, and workshops.
San Francisco Maritime NHP	Van Ness/Beach	National Park Service	This area includes the following facilities and services: piers, historic vessels, beach, museum, library, visitor's center, park, tours, musical, lectures, classes, demonstrations, bocce ball courts, national landmarks, and picnic areas.
Joseph Conrad Mini Park	Leavenworth/Beach	SF Recreation & Park Dept.	This area provides benches and open space.
Marina Green Park	Marina/Fillmore	SF Recreation & Park Dept.	
East Harbor	Marina/Webster	SF Recreation & Park Dept.	This area consists of 343 boat slips and park land which includes a restroom, and two parking lots.
Facilities Near the Study Area			
George R. Moscone Recreation Center	Top of Form 1800 Chestnut St. Bottom of Form	SF Recreation & Park Dept.	This area includes four baseball diamonds, four tennis courts, two basketball court areas, a gymnasium, two putting greens, and a playground.
Russian Hill Park	Bay/Hyde	SFPUC-Water Dept.	This area provides benches and open space.

3.8.5 Parklands in the Study Area

Fort Mason Center at the Golden Gate National Recreation Area. The Golden Gate National Recreation Area (GGNRA) is composed of over 75,500 acres encompassing portions of San Francisco, Marin, and San Mateo Counties. The GGNRA is under the jurisdiction of the National Park Service (NPS) and includes residential, commercial, and recreational uses. Fort Mason, which is one of the components of the GGNRA, comprises 63 acres located within the City of San Francisco along Bay Street, between Laguna Street and Van Ness Avenue. Fort Mason is divided into two areas, Fort Mason Center, also known as Lower Fort Mason, and Upper Fort Mason. Fort Mason Center is

administered by the Fort Mason Foundation and is composed of nine buildings with 300,000 square feet of space. The Center provides various facilities and activities such as fishing piers, theater, café, exhibits, fairs, lectures, festivals, performances, symposia, classes, and workshops. Upper Fort Mason is composed of 34 buildings, which are utilized for various purposes and activities such as residences, a youth hostel, a visitor's center, and other private activities. The recreational area within Upper Fort Mason provides community gardens, picnic areas, fitness areas, and grassy fields.

San Francisco Maritime National Historical Park. The San Francisco Maritime NHP, established in 1988 as a separate National Park, contains 50-acres located along Beach Street, between Van Ness Avenue and Hyde Street in San Francisco, abutting the GGNRA at the foot of Van Ness. The park, which is under the jurisdiction of the NPS, contains the following facilities: the Hyde Street Pier, eight historic vessels, six of which are National Historic Landmarks, a collection of historic small craft, the Aquatic Park National Historic Landmark District, the Maritime Museum and the San Francisco Senior Center within the Aquatic Park Bathhouse Building, Victorian Park, the Sea Scout Base, the Tubbs Cordage Building, the Argonaut Hotel and park Visitor Center located in the historic Haslett Warehouse, the J. Porter Shaw Maritime Library, and a museum collection of over 5 million artifacts and historic documents. The park offers tours, classes, lectures, events, recreation, education, and interpretation for all ages. The grassy areas serve as a backyard for the many people who live in the neighborhood.

The San Francisco Maritime NHP is currently rehabilitating the Aquatic Park district's Bathhouse/Amphitheatre with two major construction projects, and the district's first Cultural Landscape Report (CLR) has been completed. The CLR's findings/recommendations will guide future use and landscaping of the district. Planning is also underway for rehabilitation of the San Francisco Maritime NHP's historic maritime heritage and learning center (Sea Scout Base) and the district's recreational pier (Municipal Pier), both in western Aquatic Park.

Joseph Conrad Mini Park. This small 0.07-acre, triangular-shaped mini park, which is under the jurisdiction of San Francisco Department of Recreation and Parks and is located along Leavenworth and Beach Streets and provides the community with a landscaped open space.

Marina Green Park. The Marina Green Park contains approximately 77 acres of wide grassy fields, which is under the jurisdiction of San Francisco Department of Recreation and Parks. The park is located along Marina Boulevard between Lyon and Laguna Streets and is adjacent to Fort Mason and the San Francisco Marina Yacht Harbor.

East Harbor. The East Harbor is part of the San Francisco Marina Yacht Harbor. This harbor, which is under the jurisdiction of San Francisco Department of Recreation and Parks, is located along Marina Boulevard at Webster Street, adjacent to Fort Mason. The East Harbor, also known as Gashouse Cove, consists of 343 boat slips and park land which includes a restroom, and two parking lots.

3.8.6 Parkland Resources Outside the Study Area

George R. Moscone Recreation Center. The George R. Moscone Recreation Center is surrounded by commercial and residential uses, and is bordered by Laguna, Bay, Fillmore, and Chestnut Streets. The Center is under the jurisdiction of the San Francisco Recreation and Park Department and

includes four baseball diamonds, four tennis courts, two basketball court areas, a gymnasium, two putting greens, and a playground. The Moscone Recreation Center Gymnasium was recently renovated to create additional multi-purpose recreation rooms.

Russian Hill Park. This small park is located on Bay Street between Larkin and Hyde. This grassy park with trees, plantings, and benches is operated by the San Francisco Public Utilities Commission – Water Department.

3.9 VISUAL AND AESTHETIC RESOURCES

3.9.1 Introduction

The visual environment in the study area is described below to establish a baseline for comparing visual and aesthetic changes resulting from the construction and operation of the Historic Streetcar Extension Project. The visual character of the study area reflects the built-up features of San Francisco's urban landscape surrounding acres of open space, including parklands and shorelines owned and operated by the National Park Service and the City of San Francisco. Sweeping views of the Bay, Alcatraz, Marin County, and Golden Gate Bridge are ever-present and constitute the spectacular nature of viewsheds cherished by residents and visitors of this part of San Francisco. Because the long views and perspectives are as important as the visual character of the buildings, streets, and park features, descriptions of both foreground and background views are provided on a street-by-street basis, particularly in locations where changes to the landscape are most likely to occur from project implementation. Photographs of the existing landscape accompany the text (in Section 4.9) to enhance the reader's understanding of the area's visual qualities and to demonstrate a before and after visual simulation of particular viewpoints.

3.9.2 Historic Viewsheds

Golden Gate National Recreation Area (GGNRA). The urban setting of the GGNRA is incorporated into the existing views and vistas of the landscape of Fort Mason. The San Francisco Bay, the city of San Francisco, and the Golden Gate Bridge are all prominent features of the visual relationship between Upper Fort Mason and its surroundings. The Cultural Landscape Report (CLR) for Fort Mason: Golden Gate National Recreation Area (2004) describes how the once panoramic views of the bay are now blocked by dense vegetation. The CLR identifies important viewsheds from Upper Fort Mason including a view to the Golden Gate Bridge from Great Meadow, a view to the Palace of Fine Arts, a view to the Flagpole at the entrance of upper Fort Mason, as well as views to Alcatraz and Black Point Cove.

SF Maritime National Historical Park (NHP). While the SF Maritime NHP Cultural Landscape Report does not identify specific viewsheds within and from the National Historic Landmark (NHL) District, it stresses the importance of preserving visual compatibility with the elements of the NHL District. Building utilities and associated infrastructure such as water lines and electrical panels should be located in a manner that reduces visual impacts and potential adverse affects to the historic designed landscape (NPS 2010b).

In general, visual sensitivity is higher for views seen by people who are driving for pleasure or engaged in recreational activities such as hiking, walking, biking; and homeowners or renters. Sensitivity tends to be lower for views seen by people driving to and from work or as part of their work. Commuters and nonrecreational travelers tend to have momentary views and tend to be focused on traffic and not on surrounding scenery. Residential viewers typically have extended viewing periods and are concerned about changes in the views from their homes and are therefore considered to have moderate to high visual sensitivity. Viewers using recreational trails and walkways typically have high visual sensitivity as well.

3.9.3 Regulations and Policies

National Park Service General Management Plan Documents. For National Park Service resources in the study area, the Golden Gate National Recreation Area General Management Plan (1980) identifies maintaining the visual integrity of parkland facilities as an important factor in the placement and design of all new park facilities. In addition, the General Management Plan of the San Francisco Maritime National Historical Park (1997) includes an objective to design high-quality facilities that exemplify visual consistency.

2006 National Park Service Management Policies

9.1.1.2 Integration of Facilities into Park Environment. When the determination has been made through a planning process that it is appropriate for a facility to be constructed within park boundaries, all facilities will be integrated into the park landscape and environs with sustainable designs and systems to minimize environmental impact. The full integration of facilities into the park environment will involve:

- Sensitivity to cultural, regional aesthetic and environmental factors…in the selection of site, construction materials, and forms.

9.1.5.3 Utility Lines. Where feasible, NPS utility lines will be placed underground, except where such placement would cause significant damage to natural or cultural resources (such as historic structures or cultural landscapes). When placed aboveground, utility lines and appurtenant structures will be located and designed to minimize their impact on park resources and values. Whenever possible and visually acceptable, all utilities will share a common corridor and be combined with transportation corridors. Cost-effectiveness, reliability of service, and visual impact will be considered when deciding whether to install utility lines aboveground or underground.

9.2.3 Traffic Signs and Markings. Signs will be limited to the minimum necessary to meet information, warning, and regulatory needs and to avoid confusion and visual intrusion.

9.1.3.1 Construction Sites. Visual intrusions will be kept to a minimum.

San Francisco General Plan – Transportation Element. San Francisco has adopted General Plan and Specific Plan guidelines that encourage the preservation of views and enhance the visual, aesthetic, and historic elements of the urban landscape. Relevant policies that pertain to the study area are listed below.

- **Policy 2.3** – Design and locate facilities to preserve the historic city fabric and the natural landscape, and to protect views.

  Care must be taken to ensure that street and transit improvements are made to enhance the beauty and delicate fabric of the city and to protect views of the city, the bay, the ocean and the hills.

- **Policy 2.4** – Organize the transportation system to reinforce community identity, improve linkages among interrelated activities and provide focus for community activities.

The manner in which the transportation system is organized may contribute to or undermine social and environmental stability. Through traffic routes should not split neighborhoods or pose insurmountable barriers to movement among them. Street design and location of automobile and bicycle parking should contribute to the establishment of pedestrian-oriented neighborhood centers where residents may congregate.

- **Policy 24.1** – Preserve existing historic features such as streetlights and encourage the incorporation of such historic elements in all future streetscape projects.

  Historic streetlight removal is an ongoing problem in the city as the responsible departments argue that historic streetlights are not worth the expense. Given San Francisco's historic architectural heritage, we should be protecting more historic elements, not removing them.

- **Policy 24.2** – Maintain and expand the planting of street trees and the infrastructure to support them.

  Street trees are one of the most important elements in creating a liveable streetscape. They provide shade, create a human scale on the street, soften the edge between the building and the street, and serve as a buffer between pedestrian space and the street. Moreover, street trees are an important environmental consideration as they contribute to cleaner air. An appropriate program of irrigation and maintenance should be implemented with street tree planting.

Van Ness Corridor Plan–Transportation and Circulation Element.

- **Policy 9.2** – Provide clearly visible and readable street signs and bus stop signs to improve the legibility of bus stops for riders within the bus and for pedestrians. Such signage, however, should not overwhelm the design of the landscape/streetscape system. Provide safe and comfortable waiting areas for patrons by using well-directed street lighting and bus shelters.

San Francisco 49-mile Scenic Drive. The San Francisco 49 mile Scenic Drive is located within the project limits; a sign designating the route is located on Polk Street. According to the San Francisco Planning Department (personal communication Joshua Switzky, January 23, 2009) there are no defined visual quality objectives or requirements or city policies related to the drive.

3.9.4 Important Viewsheds

Views of the study area and from within the study area are discussed to establish the visual character and aesthetic quality of the study area and surrounding region from key viewing locations.

The criteria for identifying the importance of views are related in part to the position of the viewer relative to the resource. An area of the landscape that is visible from a particular location (e.g., an overlook) or series of points (e.g., a road or trail) is defined as a *viewshed*. To identify the importance of views of a resource, a viewshed may be broken into distance zones of foreground, middleground, and background. Generally, the closer a resource is to the viewer, the more dominant it is and the greater its importance to the viewer. Although distance zones in viewsheds may vary between different geographic regions or types of terrain, a commonly used set of criteria identifies the *foreground* zone as 0.25–0.5 mile from the viewer, the *middleground* zone as extending from the foreground zone to

3-5 miles from the viewer, and the *background* zone as extending from the middleground zone to infinity (U.S. Forest Service 1974). The following vantages points were used for the analysis of visual resources. Photos described below can be found in Section 4-9.

Turnaround Segment

Marina Boulevard near Laguna Street looking east (close-in view of North Loop). The foreground view from the eastern approach along Marina Boulevard in front of the Safeway parking lot is a street-level view of the approach towards the western edge of the Great Meadow and the Fort Mason Center security gate. The west-bound outlet of the Fort Mason Tunnel is also depicted in the middle of the background of this view. The southern edge of the North Loop turnaround would be visible from this vantage point.

Marina Boulevard near Laguna Street looking east (close-in view of South Loop). The foreground view from the eastern approach along Marina Boulevard in front of the Safeway parking lot is a street-level view of the approach towards the western edge of the Great Meadow and the Fort Mason Center security gate. The west-bound outlet of the Fort Mason Tunnel is also depicted in the middle of the background of this view. The western edge of the South Loop turnaround would be visible from this vantage point.

Marina Boulevard at Laguna Street looking northeast. Views of the San Francisco Port of Embarkation (Fort Mason) National Historic Landmark District (NHLD) dominate the middle and background of this view. The Fort Mason Center parking lot and security entrance gate are in the left side of the frame. The retaining wall and Fort Mason tunnel outlet are in the right side of the vantage point background. A sidewalk lines the curve in the road where Laguna Street meets Marina Boulevard.

Fort Mason Building C stairway looking south. This view captures the Fort Mason Center parking lot and Building A in the foreground and middle ground. The retaining wall along the Fort Mason Tunnel outlet is in the background as is the Fort Mason Center entrance and gatehouse and the edge of Great Meadow. This is the location of the proposed North Loop turnaround. Visual resources in this view include the Building A of the San Francisco Port of Embarkation (Fort Mason) NHLD.

Laguna Street at North Point Street looking north. The western edge of the Great Meadow occupies the foreground and middleground of this vantage point. Great Meadow is dominated by grassy slopes, trees and a pedestrian path. The street is lit with two streetlamps along this stretch of Laguna Street.

Fort Mason path looking northeast. Within the Great Meadow, views of the Golden Gate Bridge, the San Francisco Bay and the Marin Headlands are visible from pedestrians and bicyclists. This view depicts the western edge of the Great Meadow where the South Loop of the Turnaround would be constructed. The view of the Golden Gate Bridge is also an important viewshed identified in the GGNRA Fort Mason Cultural Landscape Report.

Transition Segment

Beach Street near Polk Street looking northwest. This view captures the western edge of the Maritime Museum in the foreground of the right side of the photo and a portion of the Bocce Court in the left side of the photo in the middleground. The West Speaker Tower peaks up from the surrounding trees in the background. A walkway leads from the front of the Maritime Museum to the promenade at Aquatic Park.

Van Ness Avenue looking south. Visual resources from this vantage point, include the Aquatic Park NHLD. Contributing features to the NHLD includes the Maritime Museum, West Speaker Tower, the State Belt Railroad Tracks, and the paved walkway system from Van Ness Avenue past the West Speaker Tower. Ghirardelli Square is in the background.

In-Street Segment

Polk Street at Beach Street looking north. The Maritime Museum is the focal point of this view at the intersection of Polk Street and Beach Street. There is a pedestrian walkway in front of the Museum and three crosswalks at this intersection allow pedestrians to directly access the Museum entrance from the opposite side of the street.

Beach Street near Hyde Street looking east. This view shows the two-lane east-bound and one-lane west-bound street in the foreground. Parking spaces line both sides of the street. Street venders occupy the north-side of the street on the sidewalk in the middleground. Victorian Park is not visible in this view, but it is located adjacent to the north sidewalk behind the street venders. The Cable Car NHLD turnaround is at the Hyde Street intersection within Victorian Park in the background. Streetlamps are positioned at the corner of Hyde Street.

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3.10 NIGHT SKY VISIBILITY AND LIGHT POLLUTION

3.10.1 Introduction

The discussion below describes the current night lighting setting in the project area in order to contrast the visibility and light pollution changes caused by the project. This section also identifies vantage points with visual clearance of the project area which may be sensitive receptors to changes in nighttime lighting levels.

In accordance with NPS Management Policies 2006, the NPS strives to preserve natural ambient lightscapes, which are natural resources that exist in the absence of human-caused light. Due to the highly urbanized setting in the project area, the preservation of a natural ambient lightscape is not an objective for the Project. However, the Project's goals should be to avoid degrading the existing night time visibility or causing intrusive light pollution to the local community.

3.10.2 Existing Conditions

Regional Setting. The project area is set in a highly urbanized and densely populated region. San Francisco and the northern waterfront, in particular, have some of the highest population levels and urbanization in the San Francisco Bay Area. With cities come extensive networks of outdoor lighting to illuminate streets, sidewalks and public spaces. Nighttime lumination of the Bay Area and San Francisco is well known through night time skyline photos taken by commercial and private photographers.

Vicinity Setting. Sources of light and glare are abundant in the northern waterfront area of San Francisco. Nighttime lighting in this highly urban environment is dominated by the presence of extensive street, parking lot lighting, security lighting, public lighting, vehicular headlights, the illuminated Ghirardelli sign above Ghirardelli Square, and well-lit shops and restaurants of the popular fisherman's wharf tourist area. The parking lot of the Fort Mason Center is well lit during evening hours. Most of these lighting sources are in use from sunset to sunrise. As is characteristic of highly urbanized areas, the glare of artificial outdoor and indoor lighting has nearly completely obscured the stars and other astronomical phenomenon in the night sky. The open spaces of the meadows and gardens of Fort Mason and the SF Maritime NHP provide a visual break from the city lights. In particular the Great Meadow is quite dark relative to the surrounding urban lightscape.

3.10.3 Viewer Groups and Viewer Responses

Viewer groups in the vicinity of the project area and their sensitivity to light level changes in the area are characterized below.

Residents. Few districts within San Francisco are exclusively commercial; most are a mix of residential and commercial uses. The northern waterfront is no exception to this rule and hosts a permanent community of residents living in the Fisherman's Wharf area. Views of the proposed transit route extension alternatives vary based on the viewer's location in the community. Some views are limited to

the immediate foreground because they are obstructed by the built environment. Others may have a direct line of vision from one or more vistas in their dwelling.

Residents on any proposed extension of the transit route are considered moderately sensitive to nighttime visual changes within project area. Residents who live within 200 feet of a proposed transit stop are considered to have high sensitivity to nighttime visual changes in the project area.

Recreational Users. Recreational users of surrounding areas, including Golden Gate National Recreation Area, SF Maritime NHP, Fort Mason, and other nearby tourist areas, would have regular views of the project area; however, because tourist activity in these areas generally occur during daylight hours, nighttime visibility is only an occasion concern. For this viewer group, nighttime visibility concerns would largely be centered on safety needs. Recreational users of the northern waterfront are considered to have a low sensitivity to nighttime visual changes in the project area.

3.10.4 Regulations and Policies

2006 National Park Service Management Policies

Lightscape Management. In accordance with *NPS Management Policies 2006*, the National Park Service strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human-caused light. The night sky that is visible during clear nights influence humans and other species of animals, such as birds that navigate by the stars or prey animals that reduce their activities during moonlit nights. Improper outdoor lighting can impede the view and visitor enjoyment of a natural dark night sky. Recognizing the roles that light and dark periods and darkness play in natural resource processes and the evolution of species, the National Park Service will protect natural darkness and other components of the natural lightscape in parks. To prevent the loss of dark conditions and of natural night skies, the Service will minimize light that emanates from park facilities.

The Service will:

- restrict the use of artificial lighting in parks to those areas where security, basic human safety, and specific cultural resource requirements must be met;
- use minimal-impact lighting techniques;
- shield the use of artificial lighting.

3.11 GEOLOGY, SOILS AND SEISMICITY

3.11.1 Introduction

This section presents the existing geologic conditions in the region of the F-Line Extension Project, including geology, soils, and seismic hazards. In this discussion, the project study area is referenced in terms of the eastern and western portions because the characteristics of the geology and soils within each portion is similar, however, the eastern and western portions of the project study area are distinct enough to warrant separate discussions. The eastern portion encompasses the study area between Mason and Van Ness Streets. The western portion encompasses the study area between the eastern edge of Fort Mason at Van Ness and Fillmore Street.

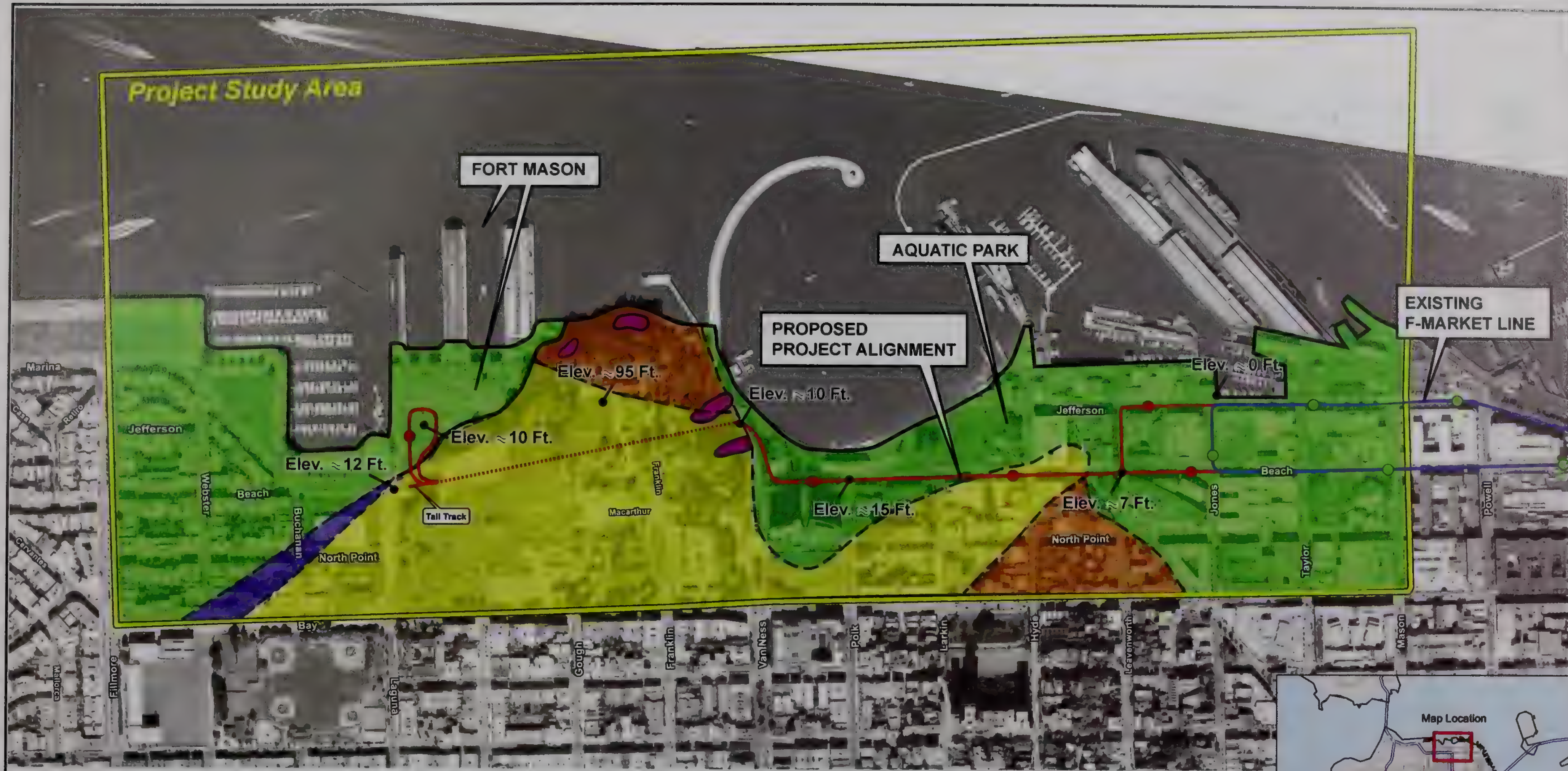
3.11.2 Environmental Setting

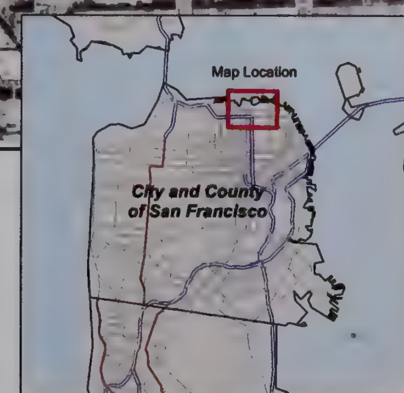
Regional Geology. The Project site is located at the northern end of the San Francisco Peninsula within the northern Coast Ranges physiographic province. This province is characterized by a north-northwest–trending series of mountains and intervening valleys that extend from the Oregon border south to the Transverse Ranges of Southern California. The ridge and valley character of the Coast Ranges province is predominantly controlled by the structural grain of the underlying geological units and long-term erosional processes. The project area is on the northern end of the San Francisco Peninsula, adjacent to the San Francisco Bay, which is thought to have formed by a down-warping of the earth's crust between the seismically active Hayward and San Andreas Faults.

Site Geology. In the eastern portion of the study area, between Jones and Leavenworth, the Project alignment runs through areas mapped as artificial fill (Qaf), consisting of sands, silt, clay, and man-made debris. Farther west between Larkin and the East portal of Fort Mason Tunnel, the Project alignment in the eastern portion and all the alignment in the western portion, also runs through artificial fill. The remainder of the alignment runs through areas mapped as Quaternary fine- to medium-grained dune sands (Qd) (Schlocker 1974). The geologic units present within the project study area are shown in **Figure 3.11-1**.

Greater detail and updated geologic mapping is available in a geotechnical investigation of the Fort Mason Tunnel completed for the Project (Kleinfelder 2005). The tunnel was constructed using cut-and-cover methods for its western half and rock blasting for its eastern half. While the tunnel alignment is mapped at the surface as dune sands; at depth, the tunnel traverses Cretaceous sandstone and shale of the Franciscan Complex along its eastern half, and artificial fill and dune sands along its western half. The eastern side of the hill traversed by the tunnel is steep and mapped by the California Geological Survey (CGS) as being underlain by slope debris and ravine fill (Qsr).However, authors of the geotechnical investigation concluded that the material is actually artificial fill (**Figure 3.11-2**).

Topography and Drainage. The topography is slightly hilly in the western portion of the study area in and around Fort Mason and primarily flat with a gentle slope in the eastern portion of the project area. Elevations in the western portion range from 30 feet above mean sea level (msl) in the south to sea level; elevations in the eastern area range from approximately 95 feet above msl to sea level. Given the





LEGEND

- Project Study Area
- Existing F-Market Line Stop
- Existing F-Market Line

Proposed Fort Mason Extension

- Above ground
- Underground
- Proposed Fort Mason Extension Stop

Source: Schlocker, 1974

Geology

- Qaf — Artificial Fill: sand, silt, clay, rock, and man-made debris
- Qrb — Beach Deposits: well sorted medium to coarse sand
- Qd — Dune Sand: well sorted fine to medium sand
- Kjss — Sandstone: Thick-bedded massive greywacke interlayed with thin layers of shale and sandstone
- Slope Debris and Ravine Fill: angular rock fragments in sand, silt, and clay matrix

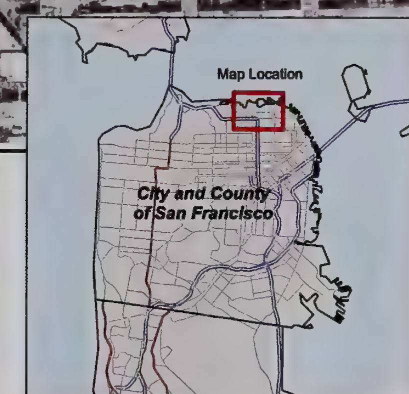
N

0 0.125 0.25
Scale in Miles

AREA GEOLOGY

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 3.11-1



LEGEND

- Project Study Area
- Existing F-Market Line Stop
- Existing F-Market Line

Proposed Fort Mason Extension

- Above ground
- Underground
- Proposed Fort Mason Extension Stop

Source: CCSF, 2000

Zones of Required Investigation

Liquefaction:

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacement such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacement such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

N

0 0.125 0.25

Scale in Miles

SEISMIC HAZARD ZONES

Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 3.11-2

topography within the study area, stormwater would generally drain in a northwesterly direction towards the San Francisco Bay, except on the eastern slope of the tunnel. Stormwater drainage in the area is captured by San Francisco's combined sewer system and treated at the Southeast Treatment Plant prior to discharge (SFPUC 2010).

Soils. Soils mapped by Natural Resources Conservation Service (NRCS) in the study area fall under three classifications: Urban Land; Urban land-Orthents - cut and fill complex (5 to 75 percent slopes); and Urban land-Orthents - reclaimed complex (0 to 2 percent slopes). These classifications indicate that the soils present in the study area are highly disturbed and have little agricultural viability.

Mineral Resources. Mineral resources include aggregate materials (such as sandstone, quarts, etc.) or petroleum resources. In 1987, the California Division of Mines and Geology (CDMG) published a comprehensive mineral land classification for aggregate materials in the San Francisco-Monterey Bay Area (Stinson et al., 1987). The study area is classified as an area where there are no significant mineral deposits present and where little likelihood exists for their presence (MRZ-1)[1].

Faults and Seismicity. The project area is located in a region of high seismic activity with numerous active and potentially active faults[2] (Figure 3.11-2). The project area is influenced by the faults of the San Andreas system including San Gregorio, San Andreas, Hayward, Rodgers Creek, Concord-Green Valley, Calaveras, and Greenville Faults. Major earthquakes have affected the region in the past and can be expected to occur again in the near future on one of the principal active faults in the San Andreas Fault System. **Table 3.11-1** lists the location of regionally active faults significant to the project area due to proximity, activity status, and Maximum Credible Earthquake (MCE). The MCE is an estimated moment magnitude[3] (Mw) for the largest earthquake capable of occurring on a fault.

TABLE 3.11-1: MAJOR FAULTS IN MUNI F-LINE EXTENSION VICINITY

Fault Name	Minimum Horizontal Distance to F-Line Site (miles)	Fault Length (miles)	Maximum Moment Magnitude (MW)	Probability of M 6.7 or Higher in the Next 30 Years (percent)
San Andreas (North Coast Segment)	9.5	280	7.9	21
San Gregorio	15	78	7.3	6
Hayward	14	62	6.9	31
Rodgers Creek	24	38	7.0	31
Concord-Green Valley	30	40	6.9	3
Greenville-Marsh Creek	31	43	6.9	3

[1] MZ-1 is a mineral classification given by CDMG. See the Regulatory Setting of this section for a full list of classifications.

[2] An active fault is defined by the CGS as a fault that has had surface displacement within Holocene time (approximately the last 11,000 years).

[3] Earthquake magnitudes are also measured by their moment magnitude (Mw), which is related to the physical characteristics of a fault, including the rigidity of the rock, the size of fault rupture, and the movement or displacement across a fault.

The individual faults that present the greatest seismic risk to the project study area are the Hayward and the San Andreas faults. The San Andreas fault is located approximately 9 miles to the southwest of the site and is the major tectonic boundary between the Pacific and North American plates. This portion of the San Andreas fault also marks the boundary with the less active San Francisco Bay block described by Olsen et al. (1994). The San Francisco Bay block is an area of low to moderate rates of seismicity which is largely un-dissected by Holocene (last 11,000 years) active faults. The Hayward fault, located approximately 14 miles to the east, is another major active tectonic feature in the Bay Area, and separates the Bay block from the East Bay hills. The 2007 Working Group on California Earthquake Probabilities estimates that the Bay Area has a 63 percent chance of experiencing one or more earthquakes of M 6.7 or higher over the next 30 years (Working Group on California Earthquake Probabilities 2008).

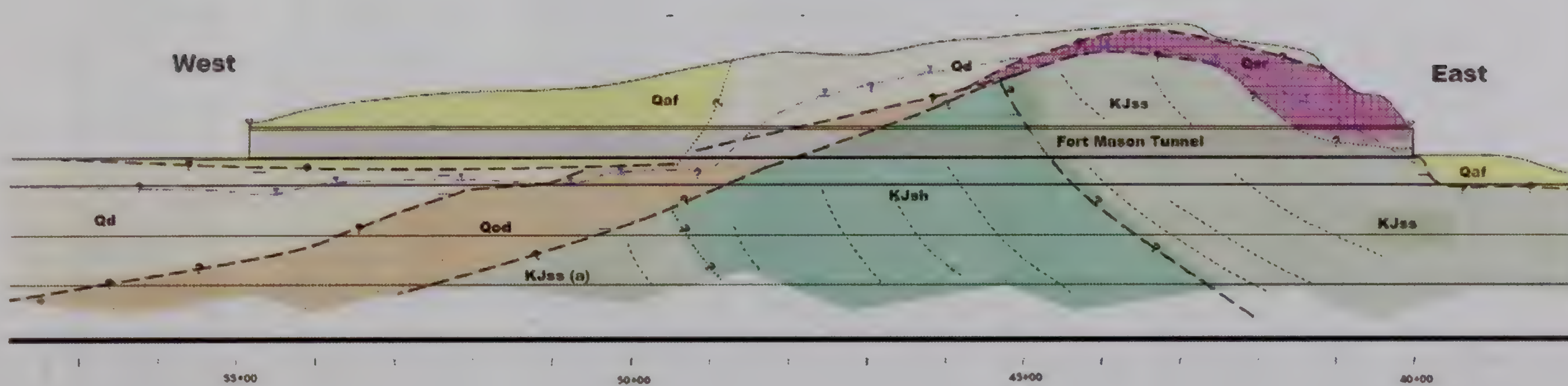
Significant Faults. The following paragraphs briefly describe each of the major faults, from west to east (listed in Table 3.11-1 and shown on **Figure 3.11-3**). Fault data were obtained from Bortugno et al. (1991) and the Working Group on California Earthquake Probabilities (Working Group on California Earthquake Probabilities 2008).

San Gregorio Fault. The San Gregorio fault is a major Holocene active fault that lies west of the San Andreas fault. The fault is approximately 78 miles long, extending from the Big Sur area northward to the area offshore of Bolinas Bay. Most of the fault lies offshore. However, in several areas, the fault lies onshore and has been actively investigated (Simpson et al. 1992). The fault has an estimated Quaternary slip rate of 5 mm/yr. Paleoseismic estimates of earthquake recurrence intervals on the fault range from 350 to 680 years based on offset archeological remains at Seal Cove (Simpson et al. 1992). The San Gregorio fault is located approximately 15 miles from the site and the maximum earthquake magnitude for the fault is estimated to be approximately Mw 7.3.

San Andreas Fault. The San Andreas fault is the largest active fault in California, and extends from the Gulf of California on the south end to approximately 750 miles to Cape Mendocino on the north end. It was the source of the 1906 Mw 7.9 San Francisco earthquake (Wallace 1990), which ruptured approximately 280 miles of the fault from San Juan Batista to Shelter Cove. The fault is about 9.5 miles southwest of the site at its closest approach.

The San Andreas fault can be divided into a number of segments, based on differences in geomorphology, geometry, paleo seismic chronology, seismicity, and historic displacements. In the Bay Area, these segments include the southern Santa Cruz Mountains, possible source of the 1989 Mw 7.0 Loma Prieta earthquake; the Peninsula segment; and the North Coast segment. The North Coast Segment runs from Shelter Cove in the north, to south of San Francisco. These segments have been assigned maximum earthquakes of Mw 7, Mw 7.1, and Mw 7.9, respectively.

Hayward Fault. The Hayward fault is about 62 miles long and has been divided into two fault segments: a longer southern segment, and a shorter northern segment. The fault demonstrates systematic right-lateral creep along its entire length (Lienkaemper et al. 1991). This structure is considered to be the most likely source of the next major earthquake in the San Francisco Bay area (Working Group on California Earthquake Probabilities, 2008), and is located approximately 14 miles



Qaf - Artificial fill (Historical)

Qd - Dune sand (Holocene)

Qod - Older dune sand (Holocene)

Qsr - Slope debris and ravine fill (Holocene)

KJss - Franciscan sandstone (Cretaceous-Jurassic)

KJsh - Franciscan shale (Cretaceous-Jurassic)

KJss (a) - Sandstone within KJsh (Cretaceous-Jurassic)

Source: URS

GEOLOGIC CROSS SECTION

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FIGURE 3.11-3

northeast of the study area. The Working Group on California Earthquake Probabilities has assigned maximum earthquakes of Mw 6.9 for both the northern and southern segments of the Hayward fault.

Rodgers Creek Fault. The Rodgers Creek fault is a 38-mile-long northwest-striking, right-lateral strike-slip fault that extends northward from the projection of the Hayward fault on the south side of San Pablo Bay. The Rodgers Creek fault has a long-term geological slip rate similar to the Hayward fault, and produced a large-magnitude historical earthquake in the late 1800s. The fault is about 24 miles to the north of the study area at its closest approach.

Concord-Green Valley Fault Zone. The Concord-Green Valley fault is a northwest-striking, right-lateral strike-slip fault zone that extends from the Walnut Creek area across Suisun Bay and continues to the north. The Concord fault extends for approximately 12 miles, from the northern slopes of Mount Diablo to Suisun Bay. North of Suisun Bay, the Green Valley fault continues to the north for about 28 miles. The Concord fault is an actively creeping structure that has a long-term creep rate of approximately 5 mm/yr.

It is estimated that rupture of both faults would produce a maximum earthquake of about Mw 6.9, with a recurrence interval of approximately 180 years. At its closest point, the Concord fault is approximately 30 miles from the site.

Greenville-Marsh Creek Fault. The Greenville-Marsh Creek fault is a northwest-striking strike-slip fault of the San Andreas system in the northern Diablo Range, extending from Bear Valley to the east side of Mount Diablo. This fault has a lower slip rate than other structures within the San Andreas system, with a long-term rate of approximately 1 to 3 mm/yr. This fault produced a moderate-magnitude earthquake in 1980.

Research is currently being conducted on the fault zone to better constrain its slip rate and its history of past earthquakes. The Working Group on California Earthquake Probabilities assigned a maximum earthquake of Mw 6.9 to the Greenville fault; the recurrence interval is estimated to be about 550 years. The fault is located approximately 31 miles east of the site.

3.11.3 Seismic Hazards

Surface Fault Rupture. Seismically induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults, or even along different strands of the same fault. Ground rupture is considered most likely along active faults.

No active or potentially active faults are mapped within the study area (Hart 1997). The closest fault zone to the site zoned under the Alquist-Priolo Special Studies Zone Act is the San Andreas fault. The Act requires the CDMG to designate faults considered active or potentially active and to establish zones within which studies are required for structures involving human occupancy. Based on the absence of zoned faults, the hazard from ground rupture is considered very low to negligible.

Ground Shaking. The greater the earthquake magnitude and the closer the fault rupture to a site, the greater the intensity of ground shaking. The amplitude and frequency of ground shaking is related to the size of an earthquake, the distance from the causative fault, the type of fault (e.g., strike-slip), and the response of the geologic materials at the site. Ground shaking can be described in terms of acceleration, velocity, and displacement of the ground. A common measure of ground motion during an earthquake is the peak ground acceleration (PGA). The PGA for a given component of motion is the largest value of horizontal acceleration obtained from a seismograph. PGA is expressed as the percentage of the acceleration due to gravity (g), which is approximately 980 centimeters per second squared. For comparison purposes, the maximum peak acceleration value recorded during the Loma Prieta earthquake was in the vicinity of the epicenter, near Santa Cruz, at 0.64g (ABAG 2010). Unlike measures of magnitude, which provide a single measure of earthquake energy, PGA varies from place to place, and is dependent on the distance from the epicenter and the character of the underlying geology (e.g. hard bedrock, soft sediments or artificial fills). According to California Geologic Survey, the PGA value at the study area is 0.519g with a 10% probability of being exceed in the next 50 years (CGS 2010).

The Modified Mercalli Intensity Scale (**Table 3.11-2**) assigns an intensity value based on the observed effects of ground-shaking produced by an earthquake. Unlike measures of earthquake magnitude, the Modified Mercalli (MM) intensity scale is qualitative in nature (i.e., it is based on actual observed effects rather than measured values). MM intensity values for an earthquake at any one place can vary depending on its magnitude, the distance from its epicenter, and the type of geologic material. The MM values for intensity range from I (earthquake not felt) to XII (damage nearly total), and intensities ranging from IV to X could cause moderate to significant structural damage. Because the MM is a measure of ground-shaking effects, intensity values can be related to a range of PGA values, also shown in Table 3.11-2.

While epicenter of the 1989 Loma Prieta earthquake was approximately 65 miles south of the project area, the earthquake is estimated to have caused strong (MMI VII) to very strong (MMI VIII) shaking intensities at the project area (ABAG 2010). The largest earthquake in Bay Area history was the San Francisco Earthquake of 1906, with an estimated M 7.9. This produced very strong (MMI VIII) to violent (MMI IX) shaking intensities in the project area (ABAG 2010).

Seismically induced strong ground shaking is potentially a significant geologic hazard expected in the study area. The highest peak acceleration is expected to occur from a Mw 7.9 maximum credible earthquake (MCE) event on the Northern Segment of the San Andreas fault. Strong ground shaking could either be amplified or dampened depending on the engineering properties of the soils.

Liquefaction. Liquefaction of soils occurs when loose, saturated, cohesionless soils temporarily lose shear strength during strong ground shaking. Significant factors known to affect the liquefaction potential of soils are the characteristics of the materials such as grain-size distribution, relative density, degree of saturation, the initial stresses acting on the soils, and the characteristics of the earthquake, such as the intensity and duration of the ground shaking. As indicated on Figure 3.11-3, most of the study area along the shoreline and small parts of the westernmost and easternmost portions of the study area are potentially susceptible to liquefaction hazards (California DOC 2000; ABAG 2010).

TABLE 3.11-2: MODIFIED MERCALLI INTENSITY SCALE

Intensity Value	Intensity Description	Average Peak Ground Acceleration[a]
I	Not felt except by a very few persons under especially favorable circumstances.	< 0.0017 g
II	Felt only by a few persons at rest, especially on upper floors on buildings. Delicately suspended objects may swing.	0.0017-0.014 g
III	Felt noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly, vibration similar to a passing truck. Duration estimated.	0.0017-0.014 g
IV	During the day felt indoors by many, outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.	0.014–0.039g
V	Felt by nearly everyone, many awakened. Some dishes and windows broken; a few instances of cracked plaster; unstable objects overturned. Disturbances of trees, poles may be noticed. Pendulum clocks may stop.	0.035 – 0.092 g
VI	Felt by all, many frightened and run outdoors. Some heavy furniture moved; and fallen plaster or damaged chimneys. Damage slight.	0.092 – 0.18 g
VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.	0.18 – 0.34 g
VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings, with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.	0.34 – 0.65 g
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.	0.65 – 1.24 g
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from riverbanks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.	> 1.24 g
XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.	> 1.24 g
XII	Damage total. Practically all works of construction are damaged greatly or destroyed. Waves seen on ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.	> 1.24 g

[a] Value is expressed as a fraction of the acceleration due to gravity (g). Gravity (g) is 9.8 meters per second squared. 1.0 g of acceleration is a rate of increase in speed equivalent to a car traveling 328 feet from rest in 4.5 seconds.

SOURCE: ABAG 2010

However, the results of the geotechnical analyses for the tunnel indicate that it is not subject to earthquake damage from liquefaction. A literature review assessing liquefaction of the site and its vicinity during the 1906 San Francisco and the 1989 Loma Prieta earthquakes indicated low susceptibility of liquefaction due to deep groundwater and dense nature of dune sands. Liquefaction was not observed in the Fort Mason area during the 1989 Loma Prieta earthquake or other recent earthquakes in the area (Klienfelder 2005). In addition, the literature review revealed that during the 1906 earthquake, refugee camps were located on the lawn west of the tunnel, suggesting this area was considered relatively safe and did not experience ground failures.

Subsidence and Settlement. Potential hazards in the study area include subsidence, settlement (compaction consolidation), and seismically induced settlement (dynamic compaction). Subsidence of the land surface is a general process that can be attributed to natural phenomena, such as tectonic deformation, consolidation, hydro compaction, collapse of underground cavities, oxidation of organic-rich soils, or rapid sedimentation, and also by the activities of man, such as the withdrawal of groundwater. Areas of the alignment underlain by bedrock, dense fill, and dune sand have a low susceptibility to subsidence. Areas underlain by Bay Mud, estuarine sediments, organic rubbish, or thick organic deposits may be moderately to highly susceptible to subsidence.

Settlement occurs when ground shaking reduces the amount of pressure existing between soil particles, resulting in a reduction of the volume of the soil. Settlement typically occurs in unsaturated, loose granular material or uncompacted fill soils. Structural damage potentially caused by settlement within the study area has been observed.

There was significant cracking observed in the tunnel lining crown. The compaction of the loose material above the tunnel may have happened statically over time or dynamically due to two earthquakes that occurred after tunnel construction: the 1957 San Francisco (Daly City) earthquake and the 1989 Loma Prieta earthquake (Kleinfelder 2005). The fill materials underlying the project alignment are also susceptible to future, additional seismically induced settlement during seismic events.

Kleinfelder conducted dynamic compaction analyses for the two past earthquake scenarios and two hypothetical earthquake scenarios. The PGA values for the 1957 San Francisco and 1989 Loma Prieta earthquakes were estimated from published literature. The results of the analyses, in terms of estimated settlements of dry soils, are presented in **Table 3.11-3**.

The results tabulated above do not suggest settlements that are sufficiently large to have caused crown cracking due to dynamic compaction during the 1957 and 1989 earthquakes. However, it should be noted that the soils were likely much looser before those earthquake events than they are now. In a less dense state, the fill sands over the tunnel may well have settled during the 1957 and 1989 earthquakes. Additionally, it can be seen that dynamic compaction of the surrounding fill could induce sufficient load on the tunnel lining sufficient to impact the tunnel stability during the lower design basis and design basis earthquakes.

TABLE 3.11-3: ESTIMATED SETTLEMENT IN PAST AND FUTURE EARTHQUAKE SCENARIOS

Earthquake Event	Moment Magnitude	PGA (g)	Estimated Settlement (inches)
1957 Daly City	5.3	0.15	0.2
1989 Loma Prieta	6.9	0.20	0.4
LDBE[a]	8.0	0.54	6.0
DBE[b]	8.0	0.674	8.0

[a] Bay Area Rapid Transit (BART) criteria for seismic design were used to conduct the geotechnical analysis for this project. BART criterion is based on a two-level seismic design consisting of the Lower Design Basis Earthquake (LDBE) and the Design Basis Earthquake (DBE). The LDBE for critical structures is defined as the greater of 10 percent probability of exceedance in 50 years (return period of about 500 years) or a deterministic median plus one-half standard deviation from a San Andreas earthquake of magnitude M8.

[b] The Design Basis Earthquake (DBE)for critical structures is defined as the greater of 5 percent probability of exceedance in 50 years (return period of about 1,000 years), or a deterministic median plus one standard deviation from a San Andreas earthquake of magnitude M8.

3.11.3 Other Geologic Hazards

Slope Failure and Slope Stability. Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, either triggered by static (i.e., gravity) or dynamic (i.e., earthquake) forces. Slope stability can depend on several complex variables, including the geology, structure, the amount of groundwater present, as well as external processes such as climate, topography, slope geometry, and human activity. The factors that contribute to slope movements include those that decrease the resistance in the slope materials and those that increase the stresses on the slope.

Landslides can occur on slopes of 15 percent or less, but the probability is greater on steeper slopes that exhibit old landslide features such as scarps, slanted vegetation, and transverse ridges. Landslides typically occur within slide-prone geologic units that contain excessive amounts of water or are located on steep slopes, or where planes of weakness are parallel to the slope angle. As shown in Figure 3.11-2, the north eastern portion of the Fort Mason area is mapped as a landslide zone (ABAG 2010). Consequently, Kleinfelder conducted a slope stability analysis above the eastern portal of Fort Mason Tunnel. The analysis shows that the slope at that location is stable under both static and dynamic conditions.

Expansive Soils. Expansion and contraction of expansive soils in response to changes in moisture content can cause movements that result in damage and/or distress to structures and equipment with shallow foundations. Issues with expansive soils typically occur near the ground surface where changes in moisture content typically occur. Often times, grading, site preparations, and backfill operations associated with subsurface structures can eliminate the potential for expansion. Bedrock, Quaternary dune sand, and artificial fill underlie most of the study area and their expansive properties are low. However, clay-rich sediments have expansive properties and also underlie the study area.

Erosion. Erosion is the wearing away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind and underground water. Excessive soil erosion can eventually lead to damage of building foundations and roadways. Areas that are susceptible to erosion are soils that would be exposed during the construction phase, especially those occurring along steep slopes. Typically, the soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or slope protection features.

3.11.4 Fort Mason Tunnel

A key component of the Project includes the rehabilitation of Fort Mason Tunnel. The tunnel is currently dilapidated and some of its deterioration may be attributable to geologic and seismic hazards. Fort Mason tunnel was constructed in 1914 for a single-track railway and is about 1,500 feet long with inside dimensions of about 16 feet wide at the invert elevation and 22 feet high at its highest point. The tunnel is approximately straight and aligned in a northeast-southwest direction. The tunnel was used by public railroad systems and by the United States military, but for a number of years the tunnel has been closed and currently is not operational. A visual tunnel inspection program was conducted by Kleinfelder to assess and rate the existing tunnel conditions. Each interval of tunnel lining was assigned a condition rating based on recommendations given in Federal Highway Administration Highway and Rail Transit Tunnel Inspection Manual (2003).

From Station 40+50 to Station 49+50, the tunnel lining was generally characterized as "Poor" to "Serious" condition. This is primarily due to deterioration in the tunnel arch, mainly as a result of water inflow through construction joints and other cracks, which has caused spalling, efflorescence and degradation of concrete around the cracks. From Station 50+50 to Station 52+50, the tunnel lining was rated as being in "Serious" condition due to a large longitudinal crack in the tunnel arch. These types of longitudinal cracks adversely impact the structural behavior of the lining when bent or deformed due to sideways motion.

The results of the inspections of the tunnel lining indicate there are significant leakage problems and major structural defects, such as the deteriorated lining due to years of leakage, and the longitudinal crack in the crown of the Western Section. The structural analysis also indicates that the lining does not conform to current code requirements for static loads.

3.11.5 Regulations and Policies

Alquist-Priolo Earthquake Fault Zoning Act. The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. In accordance with this act, the state geologist established regulatory zones, called "earthquake fault zones," around the surface traces of active faults and published maps showing these zones. Within these zones, buildings for human occupancy cannot be constructed across the surface trace of active faults. Each earthquake fault zone extends approximately 200 to 500 feet on either side of the mapped fault trace, because many active faults are complex and consist of more than one branch. There is the potential for ground surface rupture along any of the branches.

Title 14 of the California Code of Regulations, Section 3601(e), defines buildings intended for human occupancy as those that would be inhabited for more than 2,000 hours per year. The Project does not propose to construct habitable structures, the study area is not within an earthquake fault zone as defined by the Act (CDMG 2001). This act would not apply to the Project.

Seismic Hazards Mapping Act. The Seismic Hazards Mapping Act of 1990 was developed to protect the public from the effects of strong ground-shaking, liquefaction, landslides, or other ground failure, and from other hazards caused by earthquakes. This act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit may be granted for a site within a Seismic Hazard Zone, a geotechnical investigation of the site must be conducted and appropriate mitigation measures incorporated into the Project design.

Surface Mining and Reclamation Act. In accordance with the Surface Mining and Reclamation Act (SMARA) of 1975, the State of California has established a mineral land classification system to help identify and protect mineral resources in areas that are subject to urban expansion or other irreversible land uses that would preclude mineral extraction. Protected mineral resources include non-fuels—construction materials, industrial and chemical mineral materials, and metallic and rare minerals—as well as non-fluid mineral fuels. The act directs the state geologist to classify (identify and map) the non-fuel mineral resources of the state to show where economically significant mineral deposits occur and where they are likely to occur based on the best available scientific data. Non-fuel mineral resources include: metals such as gold, silver, iron, and copper; industrial minerals such as boron compounds, rare earth elements, clays, limestone, gypsum, salt, and dimension stone; and construction aggregate, which includes sand, gravel, and crushed stone. CGS has mapped many areas of the state using the California mineral land classification system to identify areas with known mineral resources. This system provides guidance for identifying mineral resource zones (MRZs) based on the following four general categories:

> **MRZ-1:** Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence
>
> **MRZ-2:** Areas where adequate information indicates that significant mineral deposits are present, or where it is judged that a high likelihood exists for their presence
>
> **MRZ-3:** Areas containing mineral deposits, the significance of which cannot be evaluated
>
> **MRZ-4:** Areas where available information is inadequate for assignment to any other zone

2006 National Park Service Management Policies

4.8 Geologic Resource Management. The Park Service will preserve and protect geologic resources as integral components of park natural systems. As used here, the term "geologic resources" includes both geologic features and geologic processes. The Service will (1) assess the impacts of natural processes and human activities on geologic resources; (2) maintain and restore the integrity of existing geologic resources; (3) integrate geologic resource management into Service operations and planning; and (4) interpret geologic resources for park visitors.

California Building Code. The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under State law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The CBC is based on the International Building Code. The 2007 CBC is based on the 2006 International Building Code (IBC) published by the International Code Conference. In addition, the CBC contains necessary California amendments which are based on the American Society of Civil Engineers Minimum Design Standards 7-05. The standards provide requirements for general structural design and include means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

California Department of Industrial Relations, Tunnel Safety Orders. The Tunnel Safety Orders establish minimum safety standards in places of employment at tunnels, shafts, raises, inclines, underground chambers, and premises appurtenant thereto during excavation, construction, alteration, repairing, renovating or demolishing and the following:

(1) Cut-and-cover operations such as subway stations which are both physically connected to ongoing underground construction operations and are covered in such a manner as to create conditions characteristic of underground construction.

(2) Boring and pipejacking operations 30 inches in diameter or greater in size.

City and County of San Francisco General Plan. All development within the City and County of San Francisco must be in compliance with the Community Safety Element of the General Plan, which focuses on seismic hazards. The element includes a series of maps illustrating: Bay Area Earthquake Faults; Ground Shaking Intensity due to earthquakes on the San Andreas and Hayward Faults; Areas of Liquefaction Potential; Areas Susceptible to Landslides; and Tsunami Run-Up. The revised Community Safety Element was adopted by Planning Resolution No. 14354 on April 24, 1997 and by Board of Supervisors Resolution 758-98 on August 15, 1997. It is considered a policy document rather than a formal regulation. Nevertheless, it refers to the Seismic Hazards Mapping Act, discussed above under State Regulations.

3.12 BIOLOGICAL RESOURCES

3.12.1 Introduction

This section discusses the existing biological resources known or with potential to occur in the Project area and surrounding study area (Figure 1-2). Biological resources include all flora, fauna, and associated habitats that would be affected by Project implementation. Information on biological resources is based on a site reconnaissance within the study area by URS (2006) and ESA (2010), a review of pertinent literature and databases that include information on the biological resources with potential to occur in the Project area (i.e., databases maintained by California Department of Fish and Game [CDFG], United States Fish and Wildlife Service [USFWS], and California Native Plant Society [CNPS]), a technical biological study by URS (2009b), and professional knowledge of the local biological issues.

3.12.2 Regional Setting

The Project area incorporates the permanent footprint of the proposed historic streetcar extension, in the highly developed Marina and Fisherman Wharf districts in the northeastern portion of the City of San Francisco (Figure 1-2). These districts comprise primarily high and low-density urban residential areas interspersed with community business retail locations and public use areas. The Project area begins in Fisherman's Wharf and would extend west through two national parks: the San Francisco Maritime National Historic Park (NHP) and the Golden Gate National Recreation Area's (GGNRA's) Fort Mason (Upper and Lower Fort Mason).

The footprint of the alignment would be contained within the street right-of-way (ROW), extending from the current F-line terminal on Jones Street at Fisherman's Wharf, along Beach Street to the southwestern corner of the San Francisco Maritime NHP's Aquatic Park, through the bocce ball courts in the Aquatic Park, across Van Ness Street, through the existing (but abandoned) underground Fort Mason Tunnel, and terminate in the Fort Mason parking lot at Laguna Street.

San Francisco is located in a Mediterranean climate. The rainy season usually lasts from October to April, while the warmest months in the city are usually in September and October. San Francisco experiences microclimates, which can vary from district to district. The Project area sits in a transitional microclimate and experiences both fog and sun. Cool, damp westerly winds, ocean fog, and associated low clouds often occur during the summer months, particularly from May through August.

3.12.3 Environmental Setting

The Project area runs through four areas: Lower Fort Mason, the Fort Mason Tunnel underneath Upper Fort Mason, the Aquatic Park Historic Landmark District, and Fisherman's Wharf (Figure 1-2). All of the Project area is contained within existing paved roadway, except for a small portion of undeveloped, landscaped habitat that the streetcar would traverse, in the Aquatic Park east of

Van Ness Avenue. The study area is also predominantly developed, but there are undeveloped areas in Upper Fort Mason and Aquatic Park.

Lower Fort Mason contains a parking lot, former military warehouses which now house non-profit organizations, and three historic piers. Minimal landscaping can be found in this area. A few trees are located west of Building A, outside of the Project area.

Upper Fort Mason, which the Fort Mason Tunnel runs through, is dominated by open areas covered with lawn and ornamental herbs, shrubs, and trees. Dominant trees include mature stands of Monterey cypress (*Callitropsis macrocarpa*), Monterey pine (*Pinus radiata*), palm (*Phoenix canariensis*), and eucalyptus (*Eucalyptus sp.*). Native plants are also propagated in a small section within Upper Fort Mason. The Fort Mason Tunnel itself has been abandoned for several years, and a locked gate prevents pedestrians from accessing it.

The Aquatic Park area of the San Francisco Maritime NHP is mostly developed with small amounts of open space, but also contains marine habitat where the lagoon and man-made beach occur along the waterfront in the northern portion of the study area. Open spaces are located between the waterfront and the Project area. On the west end of the Aquatic Park, at the eastern entrance to the Fort Mason Tunnel, three canary pine (*Pinus canariensis*) trees are present. Heading east, London plane (*Platanus × hispanica*) trees line the sidewalk along Van Ness Avenue. Some of the trees between the eastern entrance of the Fort Mason Tunnel and the terminus of Beach Street (described above) may need to be trimmed or removed to accommodate the streetcar alignment, which will pass through the bocce ball court area and Van Ness Avenue to reach the Fort Mason Tunnel. Between Van Ness Avenue and Beach Street is an open space area containing the bocce ball court, where there are three Victorian box (*Pittosporum undulatum*) trees and several English laurel (*Prunus laurocerasus)*. Several cottonwood trees (*Populus freomontii*) are growing along the sidewalk heading east from the bocce ball courts, and they also may need to be removed as they are within the proposed streetcar alignment. All of these trees are assumed to have been planted.

The landscaping in the open space areas in Upper Fort Mason and the Aquatic Park is well maintained. A variety of flowering shrubs, hedges, and perennials, can be found throughout these areas. The mature tree groves, expansive lawns, and planting beds give the open spaces a park-like quality.

The Fisherman's Wharf area is minimally vegetated. A few trees and bushes are intermittently located along the sidewalks. This area consists of retail business, restaurants, and tourist attractions.

3.12.4 Habitat Types

Habitats within the Project area and study area were identified and defined according to the Wildlife Habitat Relationship System (WHRS). The WHRS is operated and maintained by the California Department of Fish and Game (CDFG) in cooperation with the California Interagency Wildlife Task Group. Its aim is to provide information to wildlife managers on the likely occurrence of wildlife species on different habitats. The WHRS defines habitats based on the composition and structure of the dominant vegetation of any given area, and provides generalized information pertaining to wildlife value and use of these habitats.

Within the Project area there is only one habitat as defined by WHRS: Urban Landscaping/Developed. Within the study area, there are three habitats according to the WHRS: Urban Landscaping/Developed dominates the study area, Marine habitat is present in the San Francisco Bay in the northern part of the study area, and Coastal Scrub is present at Black Point, at the northernmost end of Upper Fort Mason.

The following paragraph describes the habitat present in the Project area – Urban Landscaping/Developed.

Urban Landscaping/Developed. This habitat consists of buildings, open areas covered in lawn, or other planted areas covered with ornamental flowers, shrubs, and trees. Trees common in the Project area include London plane, canary pine, English laurel, and cottonwood (discussed above). Park landscaping staff regularly maintain the vegetated portion of the open space areas in the Project area. These areas are unlikely to support native, special-status plant species by definition. Wildlife species likely to occur in the Project area include common urban species such as raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), house sparrow (*Carpodacus mexicanus*), and Brewer's blackbird (*Euphagus cyanocephalus*). In addition, birds and bats may nest/roost in the Fort Mason tunnel.

3.12.5 Federal Special-Status Species

The designation of federal-status species includes all federally listed species and species proposed for listing under the Federal Endangered Species Act (FESA). Federal-status species with the potential to occur in the vicinity of the project were identified from the following sources:

- U.S. Fish and Wildlife Service (USFWS) species list provided for the 7.5-minute United States Geological Survey (USGS) quadrangle for the Project area (San Francisco North) and adjacent quadrangles (USFWS 2009 and 2010).
- Species records in the California Natural Diversity Database (CNDDB) for the 7.5-minute USGS quadrangle for the Project area (San Francisco North) and adjacent quadrangles with similar habitat conditions (San Francisco South and Point Bonita) (CDFG 2009 and 2010).
- Species records in the California Native Plant Society (CNPS) database of rare and endangered plants for the San Francisco North, San Francisco South, and Point Bonita 7.5-minute USGS quadrangles (CNPS 2010).
- A reconnaissance survey conducted in November 2006 by URS biologist Melissa Newman helped determine whether there is any suitable habitat to support federally listed species in the Project area.

Table 1 in Appendix D lists the federal-status plant and wildlife species with occurrence records within the Project vicinity. This table includes the scientific and common names, legal status, habitat preference, and the recorded and potential occurrence of these species within the Project area. Most of the federal-status species are not expected to occur in the Project area or have a low potential for occurrence, because the habitat elements they require either were never present or are no longer found on the highly managed and modified lands in the Project area.

Federal-Status Plants. As previously noted, the Project area consists of paved roadways and landscaped habitats, and does not have appropriate habitat for any federal-status plant species. No federal-status plant species or their habitats were observed during URS's reconnaissance survey in November 2006 (URS 2009b), and there are no recent records for federal-status plant species in the Project area (CDFG 2010). Further, no federally-designated critical habitat is located where the streetcar extension project is proposed. Based on these factors, no federal-status plant species are expected to occur in the Project area.

Federal-Status Wildlife. The Project area is predominantly developed and lacks suitable habitat for federal-status wildlife species. Most of the federal-status species that currently occur in the area require either fresh or saltwater habitat, or native vegetation, neither of which occurs in the Project area. Comprehensive wildlife surveys have not been completed for the Project area; however, no federal-status wildlife species were observed during URS's November 2006 site visit or ESA's 2010 site visit, and there are no recent records of federal-status wildlife species in the Project area (CDFG 2010). Critical habitat has been designated for several anadromous fish species in the waters of San Francisco Bay (and thus within the Project study area), but there will be no direct or indirect effects from Project construction or operation on these habitats and these will not be discussed further.

Within the study area, the limited native plant areas in Upper Fort Mason and the landscaped habitat in Aquatic Park are not anticipated to provide nesting and/or foraging habitat for the California least tern (*Sterna antillarum browni*). The coastal habitat along the San Francisco Bay in the study area may be suitable habitat for the short-tailed albatross (*Diomedea albatrus*) and California brown pelican (*Pelecanus occidentalis californicus*). These three species are not expected to use the Project area as nesting habitat, but there is a very low potential for them to disperse through the Project corridor. The coastal scrub habitat at Black Point in the study area may also be suitable habitat for two federal-status butterfly species, mission blue butterfly (*Icaricia icarioides missionensis*) and San Bruno elfin butterfly (*Incisalia mossii bayensis*). This coastal scrub area is a remnant of native vegetation surrounded by urban development, and therefore, offers low-quality habitat. Nevertheless, if the host plants for these butterfly species occur in this coastal scrub, there is a low potential these species could use the Project area as a corridor for dispersal. However, this patch of coastal scrub would not be affected or modified by the Project.

Additional Special-Status Species. In addition to federally-listed species, this EIS also considers state and locally rare and sensitive species that may occur in the Project area to be "special-status," including: (1) species considered threatened, endangered, a species of special concern, or a fully protected species by the California Department of Fish and Game; (2) plant species considered rare, threatened, or endangered by the California Native Plant Society (a CNPS List 1 or 2 species as described below); (3) species that are a candidate for listing as threatened or endangered under federal or state law; or (4) bird species protected by the federal Migratory Bird Act or California Fish and Game Code Sections 3503, 3503.5, or 3513 (described under *Regulatory Framework* below). As part of this review, the following criteria were used to identify additional special-status species with potential to occur in the vicinity of the project:

- A search of state-status species occurrences in the California Natural Diversity Database (CNDDB) for the 7.5-minute USGS quadrangle in the Project area (San Francisco North) and the adjacent 7.5-minute quadrangles (CDFG 2009 and 2010).

- A search of special-status species occurrences in the California Native Plant Society (CNPS) online inventory for San Francisco North, San Francisco South, and Point Bonita 7.5-minute USGS quadrangles (CNPS 2010).
- A reconnaissance survey conducted in November 2006 by URS biologist Melissa Newman. The survey helped determine whether there is any suitable habitat to support special-status species in the Project area.

Additional Special-Status Plants. Plant species that are threatened, endangered, or rare under the California Endangered Species Act are listed in Table 2 of Appendix D. During the records search described above, several additional special-status species were identified as having occurred in the vicinity of the Project area at one time. These species are not threatened or endangered under federal or state endangered species acts, but are considered rare, threatened, or endangered in California and elsewhere by CNPS (a CNPS list 1B species), or rare, threatened, or endangered in California but more common elsewhere (CNPS list 2 species). Based on the current habitat conditions and the known range of these plants, none of these plant species have potential to occur within the Project area. As a reference they are included in Appendix D.

Additional Special-Status Wildlife. Of the special-status wildlife species identified during the records search of the Project area (see Table 2 in Appendix D), most of these species require native vegetation or fresh or saltwater marsh, which is not present in the Project area. Nevertheless, several special-status bat species that do not require native habitat could be present in the Project area, including Townsend's big-eared bat (*Corynorhinus townsendii*), pallid bat (*Antrozous pallidus*), western red bat (*Lasiurus blossevillii*), and hoary bat (*Lasiurus cinerus*). In addition, there are recent records of a monarch butterfly (*Danaus plexippus*) overwintering site at Upper Fort Mason, within the study area. Finally, there is the potential for several birds of prey and other native birds to nest in the study area.

Special-Status Bats. Several bat species inhabit the Bay Area, and likely forage on occasion in the Project area. Townsend's big-eared bat, pallid bat, western red bat, and hoary bat could all potentially roost in the Project Site. Specifically, Townsend's big-eared bats and pallid bats could roost in buildings in the study area or in the Project Site's Fort Mason tunnel; although no sign of recent bat use was observed in the tunnel during a reconnaissance survey by ESA biologist Dana Ostfeld, in April 2010. Western red bats and hoary bats are tree foliage roosters, and could roost in any of the trees in the study area, or possibly in Project area trees.

Monarch Butterfly. One of the migratory routes for monarch butterflies is along the Pacific coast. During this migration, the monarchs often overwinter for several months in trees such as eucalyptus, Monterey cypress, and Monterey pines, where there is dappled sunlight and wind protection. They were observed overwintering in trees at Upper Fort Mason in the fall of 1990, although they do not occur here on a regular basis (CDFG 2010). While monarch butterflies have recently overwintered in the study area, it is unlikely that they occur in the Project area because trees within the Project area lack the wind protection and dappled sunlight requirements.

Native, Nesting Birds, including Birds of Prey. Trees in the study area at Upper Fort Mason and San Francisco Maritime National Historical Park may provide nesting or roosting habitat for birds of prey such as the great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), and Cooper's hawk (*Accipiter cooperii*). Birds of prey are

protected against take or possession, and the destruction of nests or eggs is prohibited pursuant to Section 3503.5 of the California Fish and Game Code.

In addition, native songbirds could nest in the study area, in trees, shrubs, in/on buildings, or even in the Fort Mason tunnel. Native migrating birds are protected under the federal Migratory Bird Treaty Act and the State Fish and Game Code Section 3513, and all native birds' nests and eggs are protected from needless form of take under Section 3503 of the State Fish and Game Code.

3.12.6 Regulations and Policies

Federal Regulations

The federal regulatory requirements and laws that apply to the Project include:

- Federal Endangered Species Act
- Clean Water Act, Sections 404 and 401
- Migratory Bird Treaty Act
- Marine Mammal Protection Act
- Coastal Zone Management Act

A brief description of each of the relevant laws and regulations is provided below.

Federal Endangered Species Act (FESA). Under FESA, the Secretary of the Interior and the Secretary of Commerce, jointly have the authority to list a species as threatened or endangered (16 United States Code [USC] 1533[c]). FESA defines "endangered" species as those in danger of extinction throughout all or a significant portion of their range. A "threatened" species is any species that is likely to become an "endangered" species within the foreseeable future throughout all, or a significant portion of its range. Additional special-status species include "candidate" species". "Candidate" species are those for which the U.S. Fish and Wildlife Service (USFWS) has on file enough information to propose listing as endangered or threatened. A species that has been "delisted" is one whose population has met its recovery goal target and is no longer in jeopardy of extinction.

Section 7 of FESA requires formal consultation with the USFWS or National Marine Fisheries Service (NMFS) for only those species listed as endangered, threatened or proposed for threatened or endangered. Taking of a federally listed species is prohibited under Section 9 of FESA. Taking is defined by FESA [Section 3(19)] to mean "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." An incidental take of a listed species requires consultation with the USFWS or NMFS.

Federally listed species may be addressed for a proposed project in one of two ways: (1) a nonfederal government entity may resolve potential adverse impacts to species protected under Section 10 of FESA, or (2) a federal lead agency may resolve potential adverse effects to listed species in accordance with Section 7 of FESA. Both require consultation with the USFWS or NMFS, which administers the Act and ultimately issues a final opinion determining whether a project is likely to adversely affect or

jeopardize the continued existence of a federally listed species, or result in the destruction or adverse modification of designated or proposed critical habitat proposed to be designated for such species (16 USC 1536[3],[4]).

Migratory Bird Treaty Act. The Migratory Bird Treaty Act (MBTA) of 1918 (16 United States Code 703-711) is an international treaty for the conservation and management of bird species that may migrate through more than one country. It is enforced in the United States by the USFWS, and makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in 50 CFR Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21). Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandonment of eggs or young) may be considered a "take" and is potentially punishable by fines and/or imprisonment. In 1972, the MBTA was amended to include protection for migratory birds of prey (raptors). All species and subspecies of the families listed above are protected under the provisions of the 1972 amendment.

Marine Mammal Protection Act. The Marine Mammal Protection Act, adopted in 1972, makes it unlawful to take or import any marine mammals and/or their products. Under Section 101(a)(5)(D) of this act, an incidental harassment permit may be issued for activities other than commercial fishing that may impact small numbers of marine mammals. An incidental harassment permit covers activities that extend for periods of not more than 1 year and that will have a negligible impact on the impacted species. Amendments to this act in 1994 statutorily defined two levels of harassment. Level A harassment is defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal in the wild. Level B harassment is defined as harassment having potential to disturb marine mammals by causing disruption of behavioral patterns including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. Although California sea lion and harbor seal are commonly observed in Aquatic Park and within the Project Study area, they will not be exposed to direct or indirect impacts and will not be considered further in this document.

Coastal Zone Management Act. The Coastal Zone Management Act (CZMA), Section 307 mandates that federal agency activities be "consistent to the maximum extent practicable with the enforceable policies of approved state management programs," and that this consistency be documented and coordinated with the state. A federal agency ensures consistency of its proposed actions with state management programs by submitting a consistency determination to the relevant state agency. After receipt of the consistency determination, the state agency informs the federal agency of its occurrence with, or objection to, the federal agency's consistency determination.

The San Francisco Bay Conservation and Development Commission (BCDC) is the state agency charged with administering the federal CZMA within the San Francisco Bay segment of the California coastal zone. Within the BCDC's areas of concern, the coastal zone consists of all areas located within the BCDC's jurisdiction including the San Francisco Bay, a shoreline band 100-feet landward of the bay, diked-off salt ponds and managed wetlands, and certain waterways as listed in Section 66610 of the California Government Code. Any federal activity that affects any natural resources, land uses, or water uses within BCDC's area of concern will be subject to the consistency requirement. Obligations under the CZMA must be met through the federal consistency determination process that is outlined in the CZMA Federal Consistency Regulations, 71 Federal Regulation 787-831 at 15 CFR 930.

Other Regulations and Policies

A number of non-federal regulations apply to the project with respect to protection of biological resources. The non-federal regulatory requirements and laws that apply to the Project include:

- California Native Plant Protection Act
- California Endangered Species Act
- State Bird Protection
- Fully Protected Species
- California San Francisco Tree Ordinance
- National Park Service Management Policies
- Golden Gate National Recreation Area, National Park Service Tree Ordinance
- San Francisco Maritime National Historical Park Tree Ordinances

A brief description of each of the relevant regulations is provided below.

California Fish and Game Code. Under the California Fish and Game Code, several regulations pertaining to protection of the state's biological resources were enacted. Although federal agencies are not required to comply with California's Fish and Game Code, the National Park Service makes every reasonable effort to conduct its actions consistent with relevant state laws and regulations. Relevant state laws and regulations include:

California Native Plant Protection Act. The California Native Plant Protection Act (Fish and Game Code Sections 1900–1913) and the Natural Communities Conservation Planning Act provide guidance on the preservation of plant resources. Vascular plants listed as rare or endangered by the CNPS, but which have no designated status or protection under federal or state endangered species legislation, are defined as follows:

- List 1A: Plants presumed extinct.
- List 1B: Plants rare, threatened, or endangered in California and elsewhere.
- List 2: Plants rare, threatened, or endangered in California, but more numerous elsewhere.
- List 3: Plants about which more information is needed – a review list.
- List 4: Plants of limited distribution – a watch list.

In general, plants listed on CNPS List 1A, 1B, or 2 also meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code.

California Endangered Species Act. Under the California Endangered Species Act (CESA), the CDFG is responsible for maintaining a list of threatened and endangered species (California Fish and Game Code Section 2070). The CDFG also maintains a list of candidate species, which are species the CDFG has formally noticed as being under review for addition to the list of either endangered or threatened species. The CDFG also tracks species of special concern, which are animal species whose populations have diminished and may be considered for listing if declines continue. Pursuant to the CESA, an agency reviewing a proposed project

within its jurisdiction must determine whether any state-listed endangered or threatened species may be present in the project area and determine whether the project would have a potentially significant impact on such species. In addition, the CDFG encourages informal consultation on any proposed project that could affect a candidate species.

"Take" of a species, under CESA, is defined as an activity that would directly or indirectly kill an individual of a species. The CESA definition of take does not include "harm" or "harass" as is included in FESA. As a result, the threshold for a take under CESA may be higher than under FESA because habitat modification is not necessarily considered take under CESA.

Sections 2081(b) and (c) of CESA allows CDFG to issue an incidental take permit for a state-listed threatened and endangered species only if the following specific criteria are met: (1) that take is incidental to an otherwise lawful activity, (2) that the impacts of the authorized take have been minimized and fully mitigated, (3) that the permit is consistent with regulations adopted pursuant to Sections 2112 and 2114, (4) that the applicant has ensured adequate funding to implement minimization and mitigation measures and monitor these measures for compliance and effectiveness, and (5) that issuance of the permit will not jeopardize the continued existence of a state-listed species.

Should the project applicant receive authorization to take federally listed species under FESA, take authorization may also be sought as a "consistency determination" from CDFG under Section 2080.1 of CESA. If CDFG determines that the federal statement/permit is not consistent with CESA, the applicant must apply for a state incidental take permit under section 2081(b) of the Fish and Game Code.

Protection of Birds. The California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird (sec. 3503). Specifically, it is unlawful to take, possess, or destroy any raptors (i.e., eagles, hawks, owls, and falcons), including their nests or eggs (sec. 3503.5).

The Code adopts the provisions of the Migratory Bird Treaty Act and states that it is unlawful to take or possess any designated migratory nongame bird or any part of such migratory nongame bird (sec. 3513). The state code offers no statutory or regulatory mechanism for obtaining an incidental take permit for the loss of nongame, migratory birds. Typical violations include destruction of active nests resulting from removal of vegetation in which the nests are located. Violation of the code could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction.

Fully Protected Species. Section 5050 of the California Fish and Game Code strictly prohibits the incidental or deliberate take of fully protected species. CDFG cannot issue a take permit for fully protected species, except under narrow conditions for scientific research or the protection of livestock; therefore, avoidance measures may be required to avoid a take.

San Francisco Tree Ordinance. The City of San Francisco has two protective designations in place for trees found on public and private property within the city, but not within the boundaries of the federal Golden Gate National Recreation Area. The two protective tree designations are "significant" and "landmark." A tree on private property is considered significant if any portion of its trunk is within 10 feet of the public right of way and if one of the following three things are true: (1) the tree has a diameter at "breast height" of over 1 foot ("breast height" means 4.5 feet above the ground), (2) is over 20-feet tall; or (3) has a canopy in excess of 15 feet. The "public right of way" means the street area

where cars travel. Thus, a tree that is not within the boundaries of the Golden Gate National Recreation Area, and that is a trunk within 10 feet of the sidewalk but not within 10 feet of the street would not be subject to this ordinance. If a tree is a significant tree, then it cannot be removed without obtaining a tree removal permit from the Department of Public Works.

Landmark trees are not necessarily defined by such strict criteria as the significant trees are. The San Francisco Tree Council states that a landmark tree is, "One of the largest or oldest trees in San Francisco; Of historical, cultural interest; Unique in being: Outstanding specimen of a species; Distinctive form, or; A rare or unusual species; Defines neighborhood character, Contributes to neighborhood aesthetic; Part of a unique grove or group of trees; Prominent landscape feature; Tree exists in a neighborhood with very few trees; High visibility, multiple neighbors share tree; and Important wildlife habitat." No landmark trees are currently present in the Project area.

2006 National Park Service Management Policies – Natural Resource Policies. The NPS *Management Policies 2006* direct park managers to preserve natural resources, processes, systems, and values of park units in an unimpaired condition to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them. Natural resources will be managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities (NPS 2006, Section 4). The National Park Service will strive to understand, maintain, restore, and protect the inherent integrity of the natural resources, processes, systems, and values of the parks. These are described generally in the 1916 NPS Organic Act and in the enabling legislation or presidential proclamation establishing each park.

Tree Management Guidance

Golden Gate National Recreation Area. The GGNRA would conduct the following methods for potential tree removal within its jurisdiction (Lucas 2006):

(1) Review through the National Historic Tree Act.

(2) Review through the National Environmental Policy Act.

(3) Review through the Vegetation Cutting Standard Operating Procedure.

(4) If the tree is a potential hazard, than review through the Western Regional Office Hazard Tree Standard Operating Procedure.

At any point in the review process, stipulations may be placed regarding the removal of the tree(s).

San Francisco Maritime National Historical Park. There are no specific permit regulations regarding tree removal at the San Francisco Maritime NHP except that only the San Francisco Maritime NHP has the authority to remove trees within the Park. During review of the removal of a particular tree, the Park would evaluate the natural and cultural impacts (Cullivan 2010).

3.13 PUBLIC HEALTH AND SAFETY

3.13.1 Introduction

This section discusses the potential presence of hazardous materials in the project area that may be encountered during project construction and result in health and safety hazards for construction workers, the public, and/or the environment. In addition, this section provides an overview of the regulatory framework applicable to the transportation, use, storage and disposal of hazardous materials.

The discussion is based on federal, state, and local regulatory database reviews conducted by Environmental Data Resources (EDR) to identify permitted hazardous materials uses,[1] environmental cases,[2] and spill sites[3] within ¼ mile the project alignment. Additional information regarding identified cases was obtained from site investigation reports available from the State Water Resources Control Board (SWRCB) Geotracker website (SWRCB 2010), as well as from the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) Envirostor online database (DTSC 2010).

The term "hazardous material" is defined in law as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment.[4] Materials and waste may be considered hazardous if they are poisonous (toxicity), can be ignited by open flame (ignitability), corrode other materials (corrosivity), or react violently, explode or generate vapors when mixed with water (reactivity). A hazardous waste, for the purpose of this EIS, is any hazardous material that is abandoned, discarded, or recycled.[5] The transportation, use, and disposal of hazardous materials, as well as the potential releases of hazardous materials to the environment, are closely regulated.

3.13.2 Regional Setting

Regulatory Agency-Listed Sites of Environmental Concern. The environmental setting for this chapter is based upon a review of available regulatory agency records to determine if the site or surrounding businesses or properties currently have or had, sometime in the past, been involved in hazardous materials generation, disposal, or the release of hazardous materials to the environment. EDR provided the results of a regulatory database review on November 28, 2006. The report meets the government records search requirements of the American Society for Testing Materials (ASTM)

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1 Permitted hazardous materials uses are facilities that use hazardous materials or handle hazardous wastes but that comply with current hazardous materials and hazardous waste regulations.

2 Environmental cases are sites suspected of releasing hazardous substances or that have had cause for hazardous materials investigations and are identified on regulatory agency lists. These are sites where soil and/or groundwater contamination is known or suspected to have occurred.

3 Spill sites are locations where a spill has been reported to the state or federal regulatory agencies. Such spills do not always involve a release of hazardous materials.

4 State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

5 State of California, Health and Safety Code, Chapter 6.95, Section 25124.

"Standard Practice for Environmental Site Assessments, E 1527-00." A summary of the regulatory agency lists included in the database search report is presented in **Table 3.13-1**.

TABLE 3.13-1: DESCRIPTION OF REGULATORY AGENCY LISTS

Regulatory Agency Database List	Description
National Priorities List (NPL)	Compilation of over 1,200 sites for priority cleanup under the Federal Superfund Program.
Proposed National Priorities List (PNPL)	Sites considered for NPL listing.
Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS)	Contains data on potentially hazardous waste sites that have been reported to the USEPA by California. CERCLIS contains sites which are either proposed to or on the NPL and sites which are in the screening and assessment phase for possible inclusion on the NPL.
CERCLIS No Further Remedial Action Planned (CERC-NFRAP)	CERC-NFRAP are archived sites which indicate an assessment of the site has been completed and that the EPA has determined no further steps will be taken to list the site on NPL.
Resource Conservation and Recovery Act (RCRA) Corrective Action Plan (CORRACTS)	The Resource Conservation and Recovery Act database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste. Identifies hazardous waste handlers with RCRA corrective action activity.
Resource Conservation and Recovery Information System - Treatment, Storage or Disposal Facilities (RCRIS-TSDF)	TSDF's treat, store, or dispose of waste from sites which generate, transport, store, treat and/or dispose of hazardous waste.
RCRA Registered Large and Small Quantity Generators of Hazardous Waste (LQG/SQG)	Registered generators of hazardous waste.
Emergency Response Notification System (ERNS)	The ERNS records and stores information on reported releases of oil and hazardous substances. The source of the ERNS information is from the USEPA.
Formerly Used Defense Sites Properties (FUDS)	Includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.
Cal-Sites	Previously referred to as the Abandoned Sites Program Information System, this list identifies potential hazardous waste sites, which are then screened by the Department of Toxic Substances Control (DTSC) to evaluate the need for further action.
California Hazardous Materials Incident Report System (CHMIRS)	Spills and other incidents gathered from the California Office of Emergency Services.
Hazardous Wastes & Substances Sites List (Cortese)	Historical compilation of sites listed in the LUST, SWF/LF and CALSITES databases. No longer maintained as an active database.
Proposition 65 Records (Notify 65)	This database, maintained by the State Water Resources Control Board (SWRCB), contains facility notifications about any release that could impact drinking water and thereby expose the public to a potential health risk.
Toxic Pits Cleanup Act Sites (Toxic Pits)	Sites suspected of containing hazardous substances that have not yet been cleaned up. Maintained by SWRCB.
Solid Waste Facilities/Landfill Sites (SW/LF)	Solid waste facilities and landfills that are active, inactive or closed.

TABLE 3.13-1: DESCRIPTION OF REGULATORY AGENCY LISTS (CONTINUED)

Regulatory Agency Database List	Description
Waste Management Unit Database (WMUDS/SWAT)	Waste Management Unit Database System (WMUDS) is used by the State Water Resources Control Board staff and theRegional Water Quality Control Boards for program tracking and inventory of waste management units.
Leaking Storage Tanks (LUST)	List of LUSTs compiled by the SWRCB.
Registered Underground Storage Tanks (USTs)	Active UST facilities gathered from the local regulatory agencies.
Facility Inventory Database (CA FID UST)	The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board.
Hazardous Substance Storage Container Database (HIST UST)	The Hazardous Substance Storage Container Database is a historical listing of UST sites.
Aboveground Storage Tank database (AST)	Registered Aboveground Storage Tanks.
Statewide Environmental Evaluation and Planning System (SWEEPS)	Statewide Environmental Evaluation and Planning System (SWEEPS) is an underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1980's.
Dry Cleaners	A list of drycleaner related facilities that have EPA ID numbers.
California Spills, Leaks, Investigation and Cleanup Cost Recovery Listing (CA SLIC)	This database, maintained by the SWRCB, lists spills, leaks, investigation and cleanup costs from sites.
Haznet	The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments.
Response	Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity.
Envirostor	EnviroStor database identifies sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites.
SOURCE: EDR 2006.	

Project Alignment. The records search revealed that locations along the project alignment are identified on regulatory agency lists for the generation, storage, or release of hazardous materials. The sites identified are listed in **Table 3.13-2.**

Fort Mason Turnaround Area. Fort Mason is currently listed in the FUDS database and on the Geotracker website maintained by the SFRWQCB. Additional information about hazardous materials at Fort Mason was acquired from the U.S. Army Corps of Engineers' Final Site Investigation Work Plan for Fort Mason (USACE 2009). The Fort Mason site was formerly owned and used by the U.S. Department of Defense and is part of the Defense Environmental Restoration Program. The Site Investigation Work Plan provides guidance for activities that will be conducted to satisfy the

TABLE 3.13-2: REGULATORY LISTED SITES ALONG THE PROJECT ALIGNMENT

Site Name/ Address	Regulatory List	Site Summary	Potential to Affect Project Site
PIER 47 Jones and Jefferson	ERNS	Diesel leak reported in 1987. No information on clean up available.	Low
Exxon Mobile Bulk Terminal 440 Jefferson	LUST, Cortese, SLIC	Diesel leak caused by structural failure. Remedial Action Underway.	Low
Photos Now 2800 Leavenworth St.	RCRA-SQG, FINDS, Haznet	Small quantity generator of photochemical waste.	Low
SFFD Pumping Station #2 3445 Van Ness Ave.	LUST	Case closed. Soil impacts only.	Low
PG&E Gas Plant 502-1J 680 Beach St.	CERC-NFRAP	Manufactured Gas Plant.	Low
Bowles Hopkins 765 Beach St.	CA FID UST, SWEEPS UST	USTs present; no reported release.	Low
SFFD Pumping Station #2 32999 Van Ness Ave.	CA FID UST, SWEEPS	USTs present; no reported release.	Low
San Francisco Maritime National Historical Park 900 Beach St.	RCRA-SQG, Haznet, Cortese, FINDS	Small quantity generator; no reported release.	Low
Fort Mason	FUDS	Possible soil and groundwater contamination.	High
Gashouse Cove 10 Marina Blvd.	LUST, Cortese, CA FID UST, SWEEPS UST, Haznet	Gasoline leak being confirmed.	Moderate
US DOI Golden Gate National Recreation Area Building 210 Fort Mason	CERCLIS, RCRA-SQG, FINDS, HIST UST	Federal Facility – Lead Cleanup.	High

Regulatory Lists: See Table 3.13-1 for description of agency lists.

POTENTIAL FOR ENVIRONMENTAL CONDITION – KEY:
Low Potential = The potential to create an environmental condition at the project site is considered to be low for one or several factors including, but not limited to, the following:
(1) the direction of groundwater flow is away from the project site (down-gradient); (2) remedial action is underway or has been completed at an offsite location; (3) the distance from the project site is considered great enough so as not to create a potential environmental condition; (4) only soil was affected by the occurrence, and the site is not located adjacent to the project site; (5) the reporting agency has determined no further action is necessary (case closed).
Moderate Potential = The potential to create an environmental condition at the project site is considered to be moderate, and further investigation might be necessary due to one or several factors including, but not limited to, the following:
(1) an occurrence was reported but the remedial status is unknown; (2) unable to confirm whether remedial action has been completed; (3) the occurrence is in proximity to project site; (4) groundwater flow is towards the project site (up-gradient).
High Potential = The potential to create an environmental condition at the project site is considered to be high, and further investigation is necessary due to one or several factors, including the following:
(1) an occurrence was noted onsite, and the status of the remedial action is unknown; (2) the occurrence affected groundwater and is located up-gradient from the project site.

SOURCES: Environmental Data Resources 2006; SWRCB 2010; DTSC 2010.

requirements for a Site Investigation at former Fort Mason and result in the removal and clean up of hazardous material located during the investigation, as necessary. The Site Investigation will include performing geophysical surveys to locate potential underground storage tanks (USTs) and abandoned fuel piping; drilling soil borings, collecting soil samples and collecting in-situ groundwater samples; and disposing investigation-derived waste collected during the site investigation.

The project will require excavation in Fort Mason for the installation of the loop turnaround at the western end of the alignment. North and South loop alternatives are proposed. The Site Investigation Work Plan shows a total of six sites in the North and South Loop areas that may contain hazardous materials and have an unknown remediation status. In some instances the buildings at these locations were removed and the area has been backfilled and revegetated. However, USTs, pipelines or subsurface contamination could still be present at the site. **Table 3.13-3** shows the known information about each of these areas.

TABLE 3.13-3: POTENTIAL AREAS OF CONTAMINATION AT FORT MASON AT TURNAROUND LOCATIONS

Location	Type of Hazard	Status	Potential to Affect Project Site
North Loop Area			
Tanks D-10 through D-13	Diesel Fuel Storage	Tanks Removed/ Site Condition Unknown	Moderate
Gas Station (Building 63)	Possible USTs – potential petroleum hydrocarbons	Condition Unknown	Moderate
Transformer Vault (Building 305)	Former Transformer – possible PCBs, oils	Condition Unknown	Moderate
South Loop Area			
Transformer Vault (Building 129/215)	Former Transformer – possible PCBs, oils	Removed circa 1970/ Condition Unknown	Low
PX Service Station (Building 142)	Possible USTs – potential petroleum hydrocarbons	Condition Unknown	Moderate
Boiler House (Building 135)	Potential petroleum hydrocarbons	Condition Unknown	Moderate

Other Nearby Sites. **Table 3.13-4** provides a list of nearby regulatory agency-listed sites that have documented petroleum or hazardous materials releases to soil or groundwater. If present, groundwater contamination at nearby properties could affect soil and groundwater quality at the project site depending upon the extent of contamination and the groundwater flow direction.

TABLE 3.13-4: REGULATORY LISTED PROPERTIES NEAR THE PROJECT ALIGNMENT

Site Name/ Address	Regulatory List	Distance from Sitea	Site Summary	Potential to Affect Project Site
Unocal Station 490 Bay Street	CA FID UST, Geotracker	¼ NE	No reported release.	Low
Chevron Station #9-3535 1790 Lombard Street	LUST, Cortese, Haznet, SWEEPS UST, Geotracker	1/4 S	Post Remedial Action Monitoring for Gasoline leak.	Low
Lee Property (formerly fresco) 350 Beach St.	LUST, Cortese, SWEEPS	¼ E	Post Remedial Action Monitoring for groundwater.	Low
North Beach Public Housing 531 Bay St.	LUST, Haznet,	¼ SE	Case Closed.	Low
Residential Apartment 784 Bay St.	Cortese, LUST	1/8 S	Case Closed.	Low
Residence 1580 Beach ST.	LUST, Cortese, Haznet	1/8 W	Case Closed.	Low
Shell Oil Company 1600 Bay St.	RCRA – SQG, FINDS, LUST, Cortese	¼ S	Case Closed.	Low

[a] Distances are approximate and measured in miles.

SOURCES: Environmental Data Resources, 2006; SWRCB, 2010; DTSC, 2010.

3.13.3 Regulations and Policies

Federal. The primary federal agencies with responsibility for hazardous materials management include the U.S. Environmental Protection Agency (USEPA), U.S. Department of Labor Occupational Safety and Health Administration (Fed/OSHA), and the U.S. Department of Transportation (DOT). Federal laws, regulations, and responsible agencies are summarized in **Table 3.13-5**.

State laws and regulations regarding hazardous materials are at least as stringent as federal law, and in some cases, more stringent. Enforcement of these laws is the responsibility of the state or local agency to which enforcement powers are delegated. For these reasons, the requirements of the law and its enforcement are discussed under either the state or local agency section.

State. In January 1996, the California Environmental Protection Agency (CalEPA) adopted regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The program has six elements: hazardous waste generators and hazardous waste on-site treatment; underground storage tanks; aboveground storage tanks; hazardous materials release response plans and inventories; risk management and prevention programs; and Unified Fire Code hazardous materials management plans and inventories. The plan is implemented at the local level.

The Certified Unified Program Agency (CUPA) is the local agency that is responsible for the implementation of the Unified Program (CalEPA 2009). In San Francisco, the San Francisco Department of Public Health is the designated CUPA (CalEPA 2010).

TABLE 3.13-5: FEDERAL LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible Federal Agency	Description
Hazardous Materials Management	Community Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA)	Imposes requirements to ensure that hazardous materials are properly handled, used, stored, and disposed of and to prevent or mitigate injury to human health or the environment in the event that such materials are accidentally released.
Hazardous Waste Handling	Resource Conservation and Recovery Act of 1976 (RCRA)	Under RCRA, the USEPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste from "cradle to grave."
	Hazardous and Solid Waste Act	Amended RCRA in 1984, affirming and extending the "cradle to grave" system of regulating hazardous wastes. The amendments specifically prohibit the use of certain techniques for the disposal of some hazardous wastes.
Hazardous Materials Transportation	U.S. Department of Transportation (DOT)	DOT has the regulatory responsibility for the safe transportation of hazardous materials. The DOT regulations govern all means of transportation except packages shipped by mail (49 CRF).
	U.S. Postal Service (USPS)	USPS regulations govern the transportation of hazardous materials shipped by mail.
Occupational Safety	Occupational Safety and Health Act of 1970	Fed/OSHA sets standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries (29 CFR).
Structural and Building Components (Lead-based paint, PCBs, and asbestos)	Toxic Substances Control Act (TSCA)	Regulates the use and management of PCBs in electrical equipment, and sets forth detailed safeguards to be followed during the disposal of such items.
	U.S. EPA	The USEPA monitors and regulates hazardous materials used structural and building components and affects on human health.
SOURCE: ESA, 2010		

Hazardous Waste Handling. The CalEPA Department of Toxic Substances Control (DTSC) regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. State and federal laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and, in the event that such materials are accidentally released, to prevent or to mitigate injury to health or the environment. Laws and regulations require hazardous materials users to store these materials appropriately and to train employees to manage them safely.

Under the federal Resource Conservation and Recovery Act of 1976 (RCRA), individual states may implement their own hazardous waste programs in lieu of RCRA, as long as the state program is at least as stringent as federal RCRA requirements. In California, the DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. The hazardous waste regulations

establish criteria for identifying, packaging, and labeling hazardous wastes; prescribe management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Hazardous Materials Transportation. The State of California has adopted DOT regulations for the intrastate movement of hazardous materials. State regulations are contained in Title 26 of the California Code of Regulations (CCR). In addition, the State of California regulates the transportation of hazardous waste originating in the state and passing through the state (26 CCR). Both regulatory programs apply in California.

The two state agencies that have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans). The CHP enforces hazardous material and hazardous waste labeling and packing regulations to prevent leakage and spills of material in transit and to provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP, which conducts regular inspections of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at as many as 72 locations throughout the state that can respond quickly in the event of a spill. Common carriers of hazardous waste are licensed by the CHP, pursuant to California Vehicle Code Section 32000.

Occupational Safety. The California Occupational Safety and Health Administration (Cal/OSHA) assumes primary responsibility for developing and enforcing workplace safety regulations in California. Cal/OSHA regulations (8 CCR) concerning the use of hazardous materials in the workplace require employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations, which contain training and information requirements, including procedures for identifying and labeling hazardous substances, and communicating hazard information relating to hazardous substances and their handling. The hazard communication program also requires that Materials Safety Data Sheets (MSDSs) be available to employees, and that employee information and training programs be documented. These regulations also require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and training in emergency evacuation).

OSHA regulations for underground construction (CFR 1926.800) apply to the construction of underground tunnels, shafts, chambers, and passageways. The standard requires that employees be trained to recognize and avoid hazards associated with underground construction, as well as understand emergency procedures such as evacuation plans and check-in and check-out procedures. NPS or its contractor would also be required to assign a competent person to perform all air monitoring required to determine proper ventilation and quantitative measurements of potentially hazardous gases. Additionally proper ventilation and illumination, in accordance with specific standards, is required for all workspaces (OSHA 1996).

California Department of Industrial Relations, Tunnel Safety Orders. The Tunnel Safety Orders establish minimum safety standards in places of employment at tunnels, shafts, raises, inclines, underground chambers, and premises appurtenant thereto during excavation, construction, alteration, renovation or demolition.

The orders include specifications for proper working conditions to be maintained within the tunnel including: lighting levels within the tunnel and at tunnel entrances; quantities of fresh air to be provided; fire prevention and control; and preparation of an Emergency Plan.

Emergency Response. California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan. The plan is administered by the State Office of Emergency Services, which coordinates the responses of other agencies, including Cal EPA, CHP, the Department of Fish and Game, the San Francisco Bay Regional Water Quality Control Board, and the San Francisco Fire Department (SFFD). The SFFD provides first response capabilities, if needed, for hazardous materials emergencies within the project area.

Underground Storage Tanks. State laws governing USTs specify requirements for permitting, construction, installation, leak detection monitoring, repairs, release monitoring, corrective actions, cleanup, and closure. San Francisco Department of Public Health and the SFFD are the local agencies designated to permit and inspect USTs and to implement applicable regulations.

Soil and Groundwater Contamination. In San Francisco County, remediation of contaminated sites is performed under the oversight of the San Francisco Department of Public Health and the SFRWQCB. The SFDPH implements a local program under contract with the SWRCB to provide regulatory oversight of the investigation and cleanup of soil and groundwater contamination from leaking petroleum USTs and ASTs. Regulatory oversight for investigation and cleanup of Fort Mason is provided by DTSC because Fort Mason is outside of the jurisdiction of City and County of San Francisco. At sites where contamination is suspected or known to have occurred, the project sponsor is required to perform a site investigation and prepare a remediation plan, if necessary. For typical development projects, actual site remediation is completed either before or during the construction phase of the project. Site remediation or development may be subject to regulation by other agencies.

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3.14 PUBLIC SERVICES AND UTILITIES

3.14.1 Introduction

This section discusses the utility and public service providers in the study area. Public services include emergency response and protection by fire and police agencies. Discussion of utilities and service systems include water facilities, sanitary and storm sewer facilities, electric and natural gas systems, and telecommunication systems.

3.14.2 Fire and Police Services

San Francisco Fire Department (SFFD). The SFFD provides fire protection services in the study area. Suppression forces of the SFFPD consist of approximately 1,700 firefighting and emergency medical field personnel, 42 engine companies, 18 truck companies, 18 ambulances, two rescue squads, two fireboats, and other specialized units, including a hazardous materials response unit. The companies are deployed into three divisions, which are further divided into ten battalions. Station 28 at 1814 Stockton Street is the primary station serving the study area. Other nearby stations include Station 2 at 1340 Powell Street, Station 13 at 530 Sansome Street, and Station 35 at Pier 22.5 on The Embarcadero. Engines are staffed with one officer and three firefighters; trucks are staffed with one officer and four firefighters. The SFFD response time goal is three minutes. Emergency response services are also provided by the SFFD, which assigns medical personnel to local fire stations.

United States Coast Guard (USCG). The USCG operates out of the Central Station located on Yerba Buena Island and provides water rescue and maritime-related law enforcement services for all of the inner San Francisco Bay, east of Alcatraz and up to Point San Pedro. According to the USCG, response time to the study area waterfront would be approximately 15 to 20 minutes on their standard 25-foot vessel. At any given time, 15 to 20 USCG personnel are available to respond to the study area from Yerba Buena Island.

San Francisco Police Department (SFPD). Police protection services in the study area are provided by the SFPD. The SFPD is divided into two divisions, Metro and Golden Gate. The Metro Division is comprised of five district stations encompassing downtown San Francisco. Central Station at 766 Vallejo Street serves the Financial District, Chinatown, North Beach, and Fisherman's Wharf, as well as Telegraph, Nob, and Russian Hills. The Central Station has a goal of responding to emergency calls in three to eight minutes. The Northern Police District serves the western portion of the study area (west of Fort Mason). This district serves the Western Addition, Pacific Heights, Japantown, Polk Gulch, Russian Hill, and the Marina. Response time to this portion of the study area is usually under one minute.

United States Park Police. The United States Park Police is a unit of the NPS with jurisdiction in all NPS areas and certain other Federal and State lands. San Francisco Field Office personnel are headquartered in the Presidio with another office located at Fort Mason. U.S. Park Police' primary response area is in park lands within the City and County of San Francisco, including Presidio Trust lands.

United States Park Rangers. U.S. Park Rangers are law enforcement officers who perform law enforcement patrol and other public safety services (resource education, search and rescue, wild land fire suppression and emergency medical services). U.S. Park Rangers' primary response areas are in park lands in Marin and San Mateo County. Both the U.S. Park Police and the U.S. Park Rangers hold equal authorities under the Department of Interior Manual 446 and National Park Service enabling legislation Title 16 USC 1a-6.

3.14.3 Public Utilities

Water System. The San Francisco Water Department (SFWD) supplies potable water to the study area. Water supplies to Fort Mason are delivered via 8-inch cast iron pipes at Van Ness Avenue and Bay Street. However, within Fort Mason itself, the NPS owns and operates the water distribution system. Lower Fort Mason is supplied with a 12-inch line that enters parallel to Pier 2. There is also an 8-inch line that parallels Pier 1 on Laguna Street and enters Fort Mason near the main entrance. East of the Fort Mason Tunnel, 6- and 8-inch water lines run along Beach, Jefferson, Jones, and Leavenworth Streets.

The San Francisco Public Utilities Commission (SFPUC) operates a separate and distinct water supply system used only for fire protection known as the Auxiliary Water Supply Source (AWSS). The AWSS in the study area can be supplied with salt water through the pumping station at the north end of Van Ness Avenue or by fireboats via a manifold at the north end of Pier 1. Fort Mason is served by a 14-inch line that parallels the west side of Pier 1 to Laguna Street. East of the Fort Mason Tunnel, 14- and 16-inch lines are located along Beach, Jefferson, Jones, and Leavenworth Streets.

Sanitary Sewer/Storm Drain System. The City of San Francisco provides wastewater and storm drain facilities in the study area. The City's system features a combined sanitary sewer and storm drain (SS/SD) system. The Lower Fort Mason sanitary sewer system is partially separated from the stormwater system and is operated by the NPS. The sanitary sewer system uses 6 to 18-inch lines in Lower Fort Mason that drain to a wet well. This wet well then drains to a large vault connected to the city's North Shore Outfall Tunnel. The Upper Fort Mason sanitary sewer system connects to City sewers on Bay and Laguna Streets, with the possible exception of the Youth Hostel buildings, which appear to connect to the sewer in Lower Fort Mason. All sanitary sewer lines flow to the City's combined system, with the exception of surface dock drains near the piers that discharge directly into San Francisco Bay.

East of the Fort Mason Tunnel, SS/DD lines run along Beach and Jefferson Streets and Van Ness Avenue. All SS/DD lines flow to an overflow structure on Beach Street at Powell Street. From there, flows are directed to a juncture box on Beach Street and The Embarcadero.

Electrical System. Pacific Gas and Electric (PG&E) operates the electrical system in the study area. Service to Lower Fort Mason is provided by a transformer that feeds an underground 4 kV system near Building 304, north of the Gate House. The Upper Fort Mason electrical system is a combination underground and aboveground system maintained by the NPS. This 4 kV system is fed from the PG&E substation in Lower Fort Mason by an underground line connected to a transformer house above the

retaining wall in Upper Fort Mason. Electrical lines east of the Fort Mason Tunnel are typically located at 24 to 48 inches below grade.

Gas System. PG&E operates the natural gas system in the study area. Gas is supplied to Fort Mason via a regulator station north of Building 304. The lines within the Lower Fort Mason site are typically 2- and 3-inches. All existing gas pipelines in the area east of the Fort Mason Tunnel are high pressure and are typically 24 to 36 inches below grade.

Telecommunications. Typical telecommunication infrastructure in the study area consists of below grade vaults within the street right-of-way serviced with conduits. The vaults are commonly approximately 4 to 6 feet wide and up to 10 feet long with a height of 6 feet.

3.14.4 Regulations and Policies

2006 National Park Service Management Policies

9.1.5.3 Utility Lines. Where feasible, NPS utility lines will be placed underground, except where such placement would cause significant damage to natural or cultural resources (such as historic structures or cultural landscapes). When placed aboveground, utility lines and appurtenant structures will be located and designed to minimize their impact on park resources and values. Whenever possible and visually acceptable, all utilities will share a common corridor and be combined with transportation corridors. Cost-effectiveness, reliability of service, and visual impact will be considered when deciding whether to install utility lines aboveground or underground.

City of San Francisco regulations governing the installation and repair of utilities can be found in the following codes:

San Francisco Department of Public Works Article 14: Underground Pipes, Wires and Conduits, Section 670. Privilege Granted for Laying Pipes. The privilege is hereby granted to any person, firm or corporation, organized under the laws of the State of California, to lay down, maintain and operate in the public streets and thoroughfares of the City and County of San Francisco, pipes, wires and conduits, and connections therewith, so far as may be necessary for introducing into and supplying said city and its inhabitants with gas and electricity for lighting, heating and power purposes, upon the terms and conditions set forth in Section 671 to 680, inclusive, of this Article.

San Francisco Department of Public Works Article 18: Utility Facilities. Section 901, Permits – Consent. Every owner or operator of any utility facility before installing, locating or relocating any utility facility shall file with the Director of Public Works a written application for a permit to do such work and obtain a written permit for the work as provided in Article 2.4. In accepting such permit the permittee expressly consents to regulation by any applicable rules or ordinances.

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Chapter 4
Environmental Consequences

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter discusses the environmental consequences of the project alternatives. This section introduces methodology used to assess the probable environmental consequences, or impacts, of implementing each of the alternatives, and the methods used to assess cumulative impacts. The environmental resources discussed in this chapter are the same and presented in the same order as in Chapter 3. Affected Environment. Each resource section in Chapter 4 presents the applicable analysis thresholds and methodology for evaluation of impacts, and identifies the impacts of each alternative for the specific resource area.

4.1.1 General Methodology for Analyzing Impacts

Potential impacts or effects are described in terms of type, context, duration and intensity, which are generally defined below, while more specific impact thresholds are given for each resource at the beginning of each resource section.

Type of Impact. Impacts can be either beneficial or adverse. A beneficial impact would be a positive change in the condition or appearance of the resource or a change that would move a resource toward a desired condition. An adverse impact would be a change that would move the resource away from a desired condition or would detract from its appearance or condition.

Context. Context describes the area or location (site-specific, local, parkwide, or regional) in which the impact would occur. Site-specific impacts would occur at the location of the action, local impacts would occur area, parkwide impacts would affect a greater portion of the park, and regional impacts would extend beyond park boundaries.

Duration. Duration describes the length of time an effect would occur, either short term or long-term. Short-term impacts are those caused by construction activities (from start to end of the construction period), and long-term impacts are those caused by activities associated with the operation and use of the extended F-Line (from start of streetcar operation and beyond).

Intensity. Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic.

Direct and Indirect Impacts. National Park Service policy requires that direct and indirect impacts be considered, but not specifically identified. A direct effect would occur at the same time and place as the action. An indirect effect would be caused by an action but would be later in time or farther removed in distance, but would still be reasonably foreseeable within the general vicinity of the study.

4.1.2 Cumulative Impact Scenario

The Council on Environmental Quality (CEQ) regulations that implement the provisions of the National Environmental Policy Act requires that cumulative impacts be assessed in the decisionmaking process for federal projects. Cumulative effects are defined by the CEQ regulations as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. The cumulative impact analysis includes projects both inside and outside the park. Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions within the park and outside the park, as described below.

Past Actions. Past actions are assumed to create the existing affected environment. The text will not specifically call out each action—with the exception of threshold or milestone projects identified by the resource specialist or land manager. Identified actions include:

- Fort Mason Center Long-Term Lease – The proposed long-term lease included shifting responsibility for parking management and full building maintenance (excluding substructures of piers and Building E) from the National Park Service (NPS) to the Fort Mason Foundation.
- Fort Mason Center Parking – In June 2006, Fort Mason Center implemented paid parking for the lower Fort Mason parking lot.
- Extension of the Historic F-Line to Jones Street – Construction of the extension of the F-line along Embarcadero to Jones Street in Fisherman's Wharf was completed in 2000.
- Aquatic Park Bathhouse Windows, Doors and Roofs rehabilitation project – Started in May 2006, project addressed damage to the building caused by 67 years of wind, rain, and fog, which resulted in rusted windows and doors, and a leaking roof.
- SF Bay Trail (improvements to the extensive Bay Trail (including Trail at Laguna Street). Completed in 2009.

Present Actions. Present identified actions include:

- **Restoration of the Aquatic Park Bathhouse/Amphitheater in the San Francisco Maritime National Historical Park** – Beginning in September 2008, the San Francisco Maritime NHP began restoration of the park's failing bleachers and associated underground structures. Project is close to completion.
- **San Francisco Marina Renovation Project** – The project would be constructed in two phases; Phase I at the West Harbor with construction anticipated October 2008 to March 2010 and Phase II at the East Harbor with construction anticipated July 2010 to June 2012.
- **Presidio Transit Program** – comprehensive transportation program, which will improve mobility within the park, increase the use and availability of public transit and pedestrian and bicycle options, improve connections to regional transit, and make it easier for people to get around without a car.
- **Third Street Light Rail Project Phase II and the Central Subway Project** – Construction began in 2010 and operation is expected to start in 2018.
- On-going Muni operations of existing transit lines

- On-going use of the Alcatraz Ferry at Pier 331/2-11 – 5,000-6,000 passengers per day during the peak season, whish lasts 9 months of the year.
- **721 Beach Street Development** – demolition of an existing 558-square foot one-story commercial building constructed in 1912 and construction of a 40-foot, 12,857 square-foot mixed-use building composed of four residential units and 6,558 square feet of retail space.
- **Aquatic Park Bathhouse Exhibit Plan & Installation** – The Bathhouse exhibits will be planned/installed from FY2011-2014.
- Aquatic Park Cultural Landscape Report and Implementation
- **Doyle Drive Replacement/Presidio Parkway Project** – Project construction began in early 2010 to improve seismic, structural, and traffic safety along Doyle Drive. Project will provide direct access to the Presidio and indirect access to Marina Boulevard.
- **Fort Mason - Franklin Street Houses** – Five houses are being rehabilitated for short term occupancy by Hostelling International and others. Seismic foundation work, strengthening, painting, accessibility upgrades and lead soils removal are ongoing repair and rehabilitation of the historic landscape around these houses will be a future project, informed by an overall treatment strategy based upon Fort Mason as an "evolved cultural landscape." Now to 2011.

Reasonably Foreseeable Future Actions. In general, each resource section will evaluate projects identified in the following plans:

- San Francisco Municipal Transportation Agency (SFMTA) FY 2008-09 Short Range Transit Plan (SRTP)
- San Francisco Municipal Transportation Agency (SFMTA) Transit Effectiveness Project (TEP)
- Metropolitan Transportation Commission (MTC) Draft Transportation 2035 Plan
- San Francisco Maritime NHP GMP – 2011 with emphasis on Lower Van Ness, Municipal Pier and Western Aquatic Park

Specific Projects include:

- **Fisherman's Wharf Public Realm Plan** – The Fisherman's Wharf Public Realm Plan is an inter-agency partnership, led by the San Francisco Planning Department. Design concepts under consideration for the Fisherman's Wharf Public Realm Plan would designate Jefferson Street a Pedestrian Priority Street, and would reduce vehicle traffic volumes on Jefferson Street.
- **Municipal Pier Rehabilitation Project** – to repair Municipal Pier (removal and replacement of timber piles, replacement of severed pier piles and wave baffle batter piles, etc.).
- **Rehabilitate NHL Building E Lower Fort Mason to Address Seismic and Code Deficiencies** – The project will provide seismic and system upgrades to Building E to meet safety code deficiencies.
- **Maritime Heritage Learning Center rehabilitation and program development** – Establishment of an Education Center, at the current Sea Scout base [on east side of Van Ness, just south of Municipal Pier], to provide a focal point for maritime history and education.
- **Alcatraz Transportation Feasibility Study** – GGNRA, National Park Service and the San Francisco Port Authority are conducting a feasibility study for development and operation of ferry service connecting the Marin Headlands, Alcatraz, and San Francisco. The project could result in development of an embarkation area located in the Project study area or the Project's regional area.

- **Van Ness Bus Rapid Transit (BRT)** – The BRT area would run two miles along Van Ness Avenue between Mission and Lombard. The BRT service would end five blocks before the proposed Historic Streetcar alignment. It is currently under environmental review with construction scheduled for 2013.
- **Fort Mason Center Pier 2 shed restoration** – Project work is expected to commence in the spring of 2011. The work is confined to the shed and involves exterior repairs and the installation of solar panels.
- **The E-Embarcadero Historic Streetcar Line** – Pending operating funds, SFMTA plans to initiate a basic 20-hour-a-day historic streetcar service from the Caltrain Terminal to Fisherman's Wharf.
- **Piers 27 - 31 Cruise Terminal Project** – The Port of San Francisco is evaluating development of a new primary cruise terminal located at Pier 27 near the foot of Telegraph Hill.
- **Fort Mason Cultural Landscape** – The project goal is to develop an overall treatment strategy for improving and restoring the historic landscape at Fort Mason, based upon the concept of "evolved cultural landscape. NPS's *Olmstead Center* will create a Cultural Landscape Report directing treatment, replacement and management strategies for upper Fort Mason landscapes. Treatment will start in 2011 and be ongoing yearly for at least 8 years.
- **Fort Mason Sidewalk replacement** – East of buildings #33, 34 and 35 a sidewalk in poor condition will be replaced with a wheelchair-accessible sidewalk. Seven Red Flowering Gum eucalyptus trees will be removed and replaced with the same species as part of this project. Project will begin in winter 2010
- **Fort Mason Hazard Tree Replacement** – A three year implementation plan for hazard tree removal and replacement – upper Fort Mason- A recent arborist's report reviewed 427 trees – 54 different species for health and safety. The report determined that 248 trees are high risk for falling or dropping limbs and injuring people or property. These are Priority 1 for being removed, pruned or to have cables added. The trees will be replaced per the recommendations of the upcoming Olmsted Center Cultural Landscape Report. Priority 1 actions will take place starting in winter 2010 in 3 phases: remove 45 trees -replace per upcoming Cultural Landscape Study; prune 165 trees; cable 46 trees.
- **Upper Fort Mason Entry at Bay and Franklin Streets** – Intersection upgrade: new sidewalks, striped cross-walks and curb ramps for wheel chairs will create an accessible route along Bay Ste and into upper Fort Mason. Traffic changes in upper Fort Mason will occur in order to create a standard and safer intersection; the curved drives in and out of upper Fort Mason will be removed and a curb will close the access from the south end of Franklin Street into the Officers Row housing and parking lot areas. Associated upper Fort Mason traffic changes are To Be Determined. Construction is planned for 120 days beginning in April 2011.
- **Removal of Accessibility Barriers in upper Fort Mason** – The Architectural Barriers Act Accessibility Standards (ABAAS) guides NPS access requirements, similar to the Americans with Disabilities Act (ADA) for state and commercial access. Upper Fort Mason will undergo a series of changes to conform to ABAAS standards; the Great Meadow pathways will be the first phase of this project. 2011: pathways graded and replaced, standardized curb cuts added, accessible routes defined and mapped, entry kiosks added, accessible site furnishings installed; waysides will be upgraded.
- **America's Cup** – In 2013, San Francisco will be the host city for the America's Cup sailing competition. In advance of this event, construction activities are expected to occur at the following piers: 23, 27, 29, 26, 28, 30-32, and 14-22 ½. Exact dates and construction details are unknown at this time.

4.2 LAND USE

4.2.1 Methodology and Assumptions

Guiding regulations and policies evaluated for consistency include: NPS Management Policies (2006); GGNRA General Management Plan (1980); SF Maritime National Historical Park General Management Plan (1997); as well as state and local plans described in Section 3.2.

Impact Intensity	Impact Description
Negligible:	The Project would not involve any activities that would be inconsistent with land use.
Minor:	The Project would not fully support land use policies and could be inconsistent with land use policies.
Moderate:	The Project would be inconsistent with land use policies; such inconsistencies would be localized.
Major:	The Project would be inconsistent with land use policies, and would interfere with wide-scale implementation of these policies.

Table 4.2-1 summarizes the consistency of the alternatives with relevant land use policies. Consistency determination has been made using the following categories:

- **Consistent:** The Project would be consistent with the existing policies.
- **Non consistent:** The Project would conflict with the existing policies. Project modifications may be suggested to mitigate the impacts to return to a state of consistency.

Specific inconsistencies associated with other alternatives are further discussed in the impact analysis discussion below.

4.2.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Alternative 1 establishes the baseline for comparing the action alternative since it represents no change from the existing management direction or level of management intensity. Alternative 1 would not facilitate transit connectivity or accessibility nor increase access to National Park Service facilities beyond those measures identified in the management plans.

Turnaround Segment. No changes are proposed in the Turnaround Segment under Alternative 1; therefore the existing land use of Upper Fort Mason and Lower Fort Mason in the GGNRA would remain the same.

Transition Segment. No changes are proposed in the Transition Segment under Alternative 1; therefore the existing land use of the San Francisco Maritime NHP would remain the same.

In-Street Segment. No changes are proposed in the In-Street Segment under Alternative 1; therefore land use of the San Francisco Maritime NHP would remain the same.

TABLE 4.2-1: LAND USE POLICY CONSISTENCY ANALYSIS

Plan Policy	Discussion	Conclusion, Including Recommendations to Eliminate Inconsistencies
The 1980 General Management Plan, Golden Gate National Recreation Area and Point Reyes		
2.1.2 Scientific, Technical and scholarly analysis	Throughout the process of developing the EIS, the Project is conducting scientific, technical and scholarly analysis	consistent
2.1.3 Public Participation	Four public meetings have been held throughout the Project's development	consistent
2.3.1 General Management Planning	The Project is consistent with the GGNRA General Management Plan (1980), which identifies a transit extension to make the GGNRA more available to a variety of users	consistent
2.3.1.2 Management Zoning	The Project area is within the Urban Landscape Subzone of the Natural Resources Zone; the Enhancement Zone and the Adaptive Use Zone of the Historic Resources Zone	consistent
National Park Service (NPS) Management Policies		
9.1 Construction	The Project would incorporate sustainable principles and practices into design, siting, construction, building materials, etc… and implement best management practices where feasible. Construction would comply with permit requirements.	consistent
9.2 Transportation Systems and Alternative Transportation	The Project is designed to enhance the quality of visitor experience and meets park management needs	consistent
The San Francisco Maritime National Historical Park (SF Maritime NHP) General Management Plan		
Local Context		
Understand, assess, and consider the effects of park decisions outside the park boundaries as well as inside	The SF Maritime NHP is an active cooperating agency of the Project and participates in public involvement as part of the Project planning efforts.	consistent
Work cooperatively with appropriate local groups and government agencies to emphasize the public's use of alternative modes of transportation to the park and surrounding areas	The SF Maritime NHP is an active cooperating agency of the Project and participates in public involvement as part of the Project planning efforts.	consistent
Work cooperatively with appropriate local groups and government agencies to encourage compatible, aesthetic, and planned development and recreational opportunities adjacent to park boundaries, and to provide information, orientation, and services to visitors	The SF Maritime NHP is an active cooperating agency of the Project.	consistent

TABLE 4.2-1: LAND USE POLICY CONSISTENCY ANALYSIS (CONTINUED)

Plan Policy	Discussion	Conclusion, Including Recommendations to Eliminate Inconsistencies
The McAteer-Petris Act and San Francisco Bay Plan (San Francisco Waterfront Special Area Plan)		
All work, including grading, on land within 100 feet of the Bay shoreline needs permit approval	The Project would comply with all required permits.	Consistent
Northeastern Waterfront Plan		
Calls for enhancement of the economic vitality of the Port and the City, preserving the unique maritime character, and provide for the maximum feasible visual and physical access to and along the Bay	The Project improves access to portions of the Bay while maintaining historic characteristics.	Consistent
Van Ness Avenue Plan		
Provides guidance and direction on physical arrangement of development along the Van Ness corridor	The Project retains the physical arrangement and the current alignment along the Van Ness corridor	Consistent
City of San Francisco General Plan (1996) – Urban Design Element		
Policy 2.2 – Limit improvements in other open spaces having an established sense of nature to those that are necessary, and unlikely to detract from the primary values of the open space.	The South Loop turnaround option would occur in what is now open space, whereas the North Loop turnaround option would occur in a developed area.	inconsistent/consistent

Cumulative Impacts. Alternative 1 would have no direct or indirect impacts on land use. As a result, there would be no cumulative impacts under this alternative.

Conclusions. Alternative 1 would not result in any direct, indirect impacts to land use.

4.2.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. Alternative 2 - Action Alternative was evaluated for its compatibility with existing land use plans and policies as depicted in Table 4.2-1. Land use changes that would result from the implementation of Alternative 2 include construction of streetcar tracks, platforms, and overhead wires and lights in the In-Street Segment, Transition Segment and Turnaround Segment. The In-Street Segment of the Project would be consistent with existing land use in that area, which is currently a vehicular street. Adding tracks and streetcars (and infrastructure) to this area would be consistent with surrounding land uses and the continuity of the F-line at Fisherman's Wharf. The In-Street segment is not within the National Park Service boundaries. The Transition Segment is located in the SF Maritime NHP between the Maritime Museum and the east portal of the Fort Mason Tunnel. The existing land use in this area consists of recreational park land at the tunnel portal, four sidewalks, and the bocce courts.

Construction practices would comply with National Park Service Management Policies. Construction sites would be limited to the smallest feasible area. Ground disturbance and site management would be carefully controlled to prevent undue damage to vegetation, soils, and archeological resources and to minimize air, water, soil and noise pollution. The implementation of the Alternative 2 – Action Alternative would result in a moderate short-term adverse impact to land use practices due to the temporary disturbance in land use practices due to construction.

The operation of the historic streetcar would be compatible with land use plans and policies. Table 4.2-1 illustrates the compatibility of the Project with applicable land use regulations. The implementation of Alternative 2 – Action Alternative would result in a minor long-term adverse impact to land use practices due to change in land use of the existing site, however the Project would remain consistent with applicable land use plans and policies.

Alternative 2A: North Loop Option. The North Loop Turnaround Option would be consistent with guiding regulations and policies evaluated in Table 4.2-1. The existing land use in the area designated for the North Loop Option is currently a paved parking lot in lower Fort Mason. For further information on the impact of the North Loop option to the cultural and historical resources in this area, refer to Section 4.7, Cultural Resources. The North Loop Turnaround Option would result in a negligible impact to land use.

Alternative 2B: South Loop Option. The South Loop Turnaround Option would be inconsistent with the City of San Francisco General Plan – Urban Design Element Policy 2.2 – Limit improvements in other open spaces having an established sense of nature to those that are necessary, and unlikely to detract from the primary values of the open space. The land use for the South Loop Option is currently an open space recreation area called the Great Meadow, which is used for passive and active recreational purposes. The configuration of the South Loop Turnaround Option would convert less than one acre of open space into rail track for the historic streetcar. The multi-use pedestrian and bicycle path (Bay Trail) would be realigned around the track configuration. The inner loop of the track configuration would be landscaped with plantings that are compatible with the setting. The South Loop Turnaround Option would result in a long-term moderate adverse impact.

Cumulative Impacts. Cumulative effects to land use are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect land use within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on land use include the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fort Mason Cultural Landscape, Fort Mason Sidewalk Replacement, Fort Mason Hazard Tree Replacement, upper Fort Mason Entry at Bay and Franklin Streets, Removal of Accessibility Barriers in upper Fort Mason. The beneficial impacts would result from improving safety and accessibility of features within the project study area. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to land use within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier

Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive are for the most part improvements to existing facilities in the long-term but could result in short-term adverse impacts to land use during construction. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-generated activity in areas that may have a high density of recreational use, including pedestrians, bicycles, or residential and commercial areas; however they would not significantly change the land use in the respective areas of these projects. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to land use.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a local, short-term and long-term, minor, adverse cumulative impact on land use in the project area. The local, short-term, minor effect on land use would result from construction activities. The local, long-term, minor, adverse effect on land use would result from the change in land use in areas where the historic streetcar track would be permanently constructed.

Conclusions. Overall, Alternative 2-Action Alternative is compatible with the land use plans and policies depicted in Table 4.2-1. The North Loop Turnaround Option would result in a negligible impact to land use and the South Loop Turnaround Option would result in a long-term moderate adverse impact.

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4.3 SOCIOECONOMICS

4.3.1 Methodology and Assumptions

Methods. This section describes the applicable methodology for evaluation of the socioeconomic effects associated with the Project.

Socioeconomic conditions that may be affected by the actions in the alternatives include economic impacts on local and regional employment and social impacts, such as traffic congestion in the study area, quality of life impacts for surrounding communities, and impacts on transit-dependent visitors.

The analysis of economic and social impacts is mostly qualitative and is based on readily available existing socioeconomic data and reports. The impacts on the local economy are evaluated based on employment information provided by the National Park Service and City of San Francisco staff. The NPS's Money Generation Model 2 (MGM2) has been used to estimate the direct and indirect economic impacts that the Project might have as a result of proposed construction and future operational spending.

Other specific impacts considered include visitor-related effects from changes in park access; potential economic impacts resulting from changes in employment; and quality of life impacts resulting from changes in traffic or access to the Fort Mason area.

Assumptions. Project related spending for construction and future operations would be the predominant socioeconomic impacts associated with the Project. While the Project would add a new public transit option to Fort Mason, this analysis conservatively does not project substantial visitation growth from the Project,[1] however, the *Fort Mason Center Long-Term Lease Environmental Assessment* projects an increase in visitor levels to the Fort Mason Center by 14.5 percent if Pier One, which is currently not used as an event space, is renovated. If Pier One was restored, the 2003 EA projected that the 1.6 million annual visitors would be increased to 1.9 million for the entire Fort Mason Center. Therefore, this estimate of increased visitor use could increase transit demand in the future.

As discussed in the Section 4.4 Transportation and Circulation, the degree of the shift in travel modes is projected to result in a 14.4 percent increase in transit use between the No Project levels and the levels predicted with the implementation of the F-line extension. Therefore, it may reasonably be expected that improved public transit options would favor increased use by tourists (who are less likely to have a private vehicle). This potential beneficial effect would be particularly true given that: (a) the F-Line would provide direct transit linkages to downtown areas where most of the City's major hotels are located; and (b) the transit line is more tourist-orientated given the route and the use of historic rail cars. It might also be reasonably expected that the additional public transit options may increase future demand and use of the Fort Mason conference facilities since it would be easier for its attendees to reach events held there.

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[1] Future trip levels by travel mode projections by URS indicated that a minimal net increase (1%) in future daily person trip between the No Project and Project Alternatives (URS 2009f). Nonetheless, approximately 7.8 percent future increase in Fort Mason visitation for both the No Project and Project Alternative is expected from regional population growth between 2005 and 2030.

The average San Francisco visitor is estimated to typically spend over a $170 per day (SFCVB 2009). Consequently, any net future visitation growth or length of stay increase that can be attributed to the Project would be likely to result in positive economic benefits to the City of San Francisco's economy.[2] However, unfortunately there is very little available data on current visitor use and spending within the City and particularly to Fort Mason. Therefore, given the lack of information to predict the likelihood and extent of any future net visitation growth no such economic benefits are attributed to the Project.

The addition of new public transit options for local residents in the Fort Mason area would also be expected to have a beneficial socioeconomic impact. The improved public transit would not only benefit those residents or local workers that would be inclined to use the F-Line themselves, but their travel mode shifts would likely also result in reduced traffic congestions for other residents. These factors would generally represent quality of life improvement for local residents. There should be similar though likely lesser and more occasional quality of life benefits for other City residents that are inclined to visit the Fort Mason area. However, by their very nature, such quality of life benefits can not generally be quantified or readily attributed to the Project. Therefore, no such economic benefits are attributed to the Project.

Given the various uncertainties associated with future Project use, the socioeconomic impact analysis limits its analysis to evaluating the economic impacts associated with project-related construction and operations spending.

Impact Intensity	Impact Description
Negligible:	Impacts to socioeconomic conditions would not be detectable.
Minor:	Either beneficial or adverse impacts would be slightly detectable but would not be expected to have an overall effect on the long-term character of the social and economic environment.
Moderate:	Either beneficial or adverse impacts would be detectable and would likely be long-term. Effects would result in changes on the social and economic environment on a local scale.
Major:	Either beneficial or adverse impacts would be considered to have a substantial, highly noticeable influence on the social and economic conditions in the region, and could be expected to alter those environments permanently.

4.3.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Under Alternative 1 no project-related construction would occur and as a result the local economy would not receive any benefits of temporary construction employment or spending. Consequently, there would be no direct or indirect economic impact to the San Francisco economy.

Under Alternative 1 no new transportation facilities would be built and as a result the local economy would not receive any benefits of future operations employment or spending. A relatively minor increase in future Fort Mason visitation is expected as a result of future population growth. A

[2] However it is important to recognize that the economic benefit to the City only occur if net visitation growth occurs. Merely redistributing visitor use (e.g., only attracting tourists away from one of the City's other tourist destinations) would have little if any benefit to the City economy.

comparable increase in both future private vehicle and public transit trips to Fort Mason is also expected (URS 2009f) to serve the future increase visitation to the area. As a result, the current conditions of local traffic congestion and inconvenience for out of town visitors to Fort Mason would persist but future visitation growth would occur. Consequently, there would be no direct or indirect economic impact to the San Francisco economy from not implementing the Project.

Cumulative Impacts. Since the alternative would have no direct or indirect economic impacts, no cumulative economic impacts would result under this alternative.

Conclusions. Alternative 1 would have no economic impacts to the San Francisco economy.

4.3.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Construction Spending Impact. The primary economic impact of the Project would be related to the future construction spending. URS updated previous construction cost estimates by Wilbur Smith Associates in their *Muni E-Line Extension Feasibility Study* published in 2004. As part of its updated methodology, URS determined the alignment alternatives and identified the project components. URS then determined component quantities and unit costs to develop construction cost estimates. The estimated construction costs for the Alternative 2 are shown in **Table 4.3-1**. (These cost estimates use the North Loop costs – differences between North and South Loop costs are discussed below).

TABLE 4.3-1: ESTIMATED DEVELOPMENT COST – ALTERNATIVE 2A (NORTH LOOP)

Component	Estimated Cost[a]
Site Preparation	$4,797,400
Structures	$97,200
Tunnel	$10,123,600
Utilities	$3,789,100
Trackwork	$6,065,600
Stations	$733,800
Traction power	$1,977,500
Signal System and Communications	$1,326,200
Total Construction Cost	**$28,907,200**

[a] Costs adjusted into 2010 Dollar terms. Total may not add up exacting due to rounding.

SOURCE: URS, 2009.

Construction of the Project would have a total direct construction spending benefit to the San Francisco economy of approximately $28.9 million dollars. This would be a temporary and positive impact to the local economy. However, it may be expected that only a portion of the actual construction spending would be captured by San Francisco businesses and residents. Some of the construction work may be performed by other Bay Area businesses and residents. In which case, a

portion of the direct economic benefits would instead be obtained by the other Cities in which the businesses and employees reside.

The MGM2 operate economic model was used to estimate the direct and indirect construction spending impacts to the City and County of San Francisco (MSU 2010). The MGM2Operate economic model has been developed by Michigan State University in cooperation with the National Park Service. The model projects that a large metro area such as San Francisco would capture 80 percent of the spending benefits to their economy. Consequently, the model estimates approximately a $23.1 million direct income benefit to the City's economy and that up to 214 jobs could be created temporarily from the construction activities.

In addition to these direct effects, indirect spending would be generated from spending by project employees and support businesses. The value of the indirect spending and employment is projected to add potentially up to $11.8 million in sales and 167 additional jobs during the 12 to 24 month construction period.

However, these direct and indirect economic benefits would be negligible in magnitude compared with the City's total estimated employment of 568,730. Furthermore the construction related benefits would be temporary since they would last solely for the duration of the construction activities, therefore this would result in a short-term, negligible, beneficial impact.

Construction Impacts on Local Businesses. The project construction activities along Beach Street and the extension along Jefferson and Leavenworth Streets would result in short-term disruption of traffic and parking along the route. Disturbances for specific street segments are expected to be relative short (approximately a month) and construction activities would be temporary and less extensive than the utility improvement work that occurs periodically. Businesses within nearby buildings would be to continue to operate although customers' access to the businesses may be inconvenienced. For example, visitors to the San Francisco Senior Center and the Maritime Museum could be inconvenienced during the short period that roadway construction along Beach Street would interfere with access to those facilities. However, both the Senior Center and the Maritime Museum would be expected to be able to continue to operate throughout the construction period.

Sidewalk vendors would be temporarily displaced to other locations during the construction. However, since specific locations are assigned by a daily lottery system, consequently the displacement of vendors would be distributed widely amongst all the licensed street artists. While the effects of the temporary reduction in selling spaces and pedestrian traffic may be noticeable to individual businesses and street vendors, from the perspective of the local economy the effects would not be detectable. As a result the construction impacts to street vendors would represent temporary and negligible adverse impacts to the local economy.

Operating Spending Impacts. The additional cost for operating the proposed extension was estimated to be between $2.03 million for the E-Line (adjusted into 2010 dollars) and up to $3.65 million for the F-Line option (URS 2009c). The difference in the operating costs for the two scenarios is based on the different headways along the extension. The F-Line scenario would provide more frequent service (shorter headways) and therefore would be more costly to operate.

As a conservative assumption the less expensive annual operating spending estimate of $2.03 million is used to evaluate the future operations spending benefits to the City and County of San Francisco. Of this, it is assumed that approximately $0.7 million would be used for maintenance spending (based on a typical 2 to 3 percent operations and maintenance cost for the approximately $29 million of new construction) as opposed to labor for operating the light rail.

The MGM2Operate economic model was used to estimate the direct and indirect operations spending impacts to the City and County of San Francisco (MSU 2010). The MGM2Operate model projects that a large metro area such as San Francisco would capture 100 percent of the spending benefits to their economy for operating and maintenance expenditures. Consequently, the model estimates approximately a $2.03 million direct income benefit to the City's economy and it is estimated that up to 22 jobs could be directly created annually from the future operations of the extension.[3]

In addition to these direct effects, indirect spending would be generated from spending by project employees and support businesses. The value of the indirect spending and employment is projected to add potentially up to nearly $0.7 million in sales and 13 additional jobs annually.

These direct and indirect economic benefits would be negligible in magnitude compared with the City's total estimated employment of 568,730, resulting in a long-term, negligible, beneficial impact.

Operational Impacts to Local Businesses. As discussed in the assumptions discussion to this analysis, it is conservatively assumed that no net growth in visitation to Fort Mason or the local area is projected to result from the project. Consequently, no increase in local visitor spending is attributed to the project. Instead, the primary effect of the project would be to result in mode shift for visitors as the enhanced transit opportunities are expected to encourage visitors to use public transportation instead of private vehicles. The enhanced transit options would potentially both increase Fort Mason's capacity to serve high visitation events and improve the ability for tourists and other visitors who may not have private vehicles. However, given the difficulty of projecting future use levels and given the a minor decrease in parking and a minor reduction in parking at Fort Mason and within Fisherman's Wharf it is conservatively assumed that not net increase in future visitation to the project area would occur as a result of the project.[4]

Proposed construction of a transit platform on Beach Street near Hyde Street would require the removal of approximately 12 parking spaces. It is expected that the platform structure would be predominantly located within the parking space and therefore continued operation of the existing street artist vendors may be permitted.[5] In which case, their use would continue and would not be expected to adversely

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3 The model only projects the direct construction related jobs and the total (i.e., direct and indirect) operations employment. It is conservatively assumed that a similar number of operations jobs would be directly related to the future operations.

4 Up to 35 parking spaces may be removed at Fort Mason for the transit turnaround

5 Currently, many vendors occupy the adjoining hourly parking spots and "feed the meter" during throughout the day. Although convenient for vendors, this practice is contravenes San Francisco parking regulations which requires vehicles to vacate hourly spaces after the end of the hour parking period. As a result, the potential loss of this informal practice does not represent a legitimate impact to the street artist vendors especially since vendors will continue to have adequate load-in / load out parking irrespective of the potential parking reduction for a new transit platform.

impacted.[6] However, conservatively assuming that the street vendors spaces located directly next to the platform might not be permitted to operate (and could not be accommodated without encroaching on Victorian Park) then up to 12 vendor spaces could be removed. In which case, these sidewalk vendor spaces would be permanently lost and the street artist vendors displaced to other locations. The sites that could be lost are the most popular in the Fisherman's Wharf area (San Francisco Arts Commission 2010).

Although the potential loss of these spaces would result in a net reduction in vendor spaces, there would nonetheless remain approximately 33 neighboring vendor spaces on the Beach Street block with another existing 10 spaces west of Larkin Street. Currently, the more westerly spaces are less popular and generally only fully occupied on peak weekends. However, removal of the sites nearest to the Larkin Street corner could result in a shift of the business further west down Beach Street. Although not as immediately close to current Cable Car turnaround, the sites are still in relatively close proximity and could continue to attract visitors to their stands – thereby reducing the adverse impact to street artist vendor sales within Fisherman's Wharf. Since there are existing nearby vendor spaces that currently are only used during peak weekends, this suggests that an actual reduction of operating vendor spaces would only occur during peak weekends and holidays. At other times, any vendors displaced by the project could be accommodated at other existing nearby sites which currently are typically unused.

Furthermore, since specific locations are assigned by a daily lottery system, consequently the displacement of vendors would be distributed widely amongst all the licensed street artists. While the effects of a possible permanent reduction in selling spaces may be noticeable to individual street vendors, from the perspective of the local economy the effects would not be detectable. As a result the project related impacts to street vendors would represent permanent and negligible adverse impacts to the local economy.

Alternative 2B: **South Loop Option.** The construction costs for the Alternative 2B (South Loop) are shown in **Table 4.3-2**. The construction cost for the Alternative 2B (South Loop) is approximately $30.8 million and $1,884,700 higher than that for the Alternative 2A: North Loop.

Using the same approach as applied for the Alternative 2A (North Loop) the MGM2Operate economic model estimates approximately a $24.6 million direct income benefit to the City's economy and that up to 228 jobs could be created temporarily from the construction activities.

In addition to these direct effects, indirect spending would be generated from spending by project employees and support businesses. The value of the indirect spending and employment is projected to add potentially up to $12.6 million in sales and 178 additional jobs during the 12 to 24 month construction period.

Consequently, it is expected that the Alternative 2A (North Loop) would result in negligible positive short-term economic impacts to the City and County of San Francisco economy.

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[6] Arguably, these spaces and other vendors along Beach Street may experience greater pedestrian traffic and potential customer

TABLE 4.3-2: ESTIMATED DEVELOPMENT COST – ALTERNATIVE 2B (SOUTH LOOP)

Component	Estimated Cost[a]
Site Preparation	$5,281,300
Structures	$417,600
Tunnel	$10,123,600
Utilities	$3,789,800
Trackwork	$6,967,600
Stations	$679,100
Traction power	$2,156,000
Signal System and Communications	$1,376,800
Total Construction Cost	**$30,791,900**

[a] Costs adjusted into 2010 Dollar terms. Total may not be exact due to rounding.

SOURCE: URS, 2009.

No differences were estimated in the annual operating costs for the South Loop and North Loop configurations (URS 2009e). Given the similarity in their physical configurations and construction costs, it may be expected that there would be no significant difference in their future annual operating costs. Therefore, the economic impacts for operating of the Alternative 2B (South Loop) would be the same as those identified for the Alternative 2A (North Loop).

Consequently, it is expected that the Alternative 2B (South Loop) would result in negligible positive long-term economic impacts to the City and County of San Francisco economy.

Cumulative Impacts. Cumulative effects to socioeconomics are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect visitation and visitor spending at local businesses within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial socioeconomic effect include the Presidio Transit Program, the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fisherman's Wharf Public Realm Plan, Van Ness Bus Rapid Transit, E-Embarcadero Historic Streetcar Line, and SFMTA's Transit Effectiveness Project. The beneficial impacts would result from increased use of transit (with a corresponding decrease use of private automobiles). The degree of travel mode shift away from private automobiles is not certain. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial socioeconomic impact to visitation and/or visitor spending at local businesses within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive could result in short-term adverse impacts on visitation and

spending to local businesses. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-related inconveniences to visitors to the project area. Construction activities would increase traffic on local roadways, both from equipment and material haul trips and commute trips by construction workers. The intensity of the adverse effects from the construction-related traffic and other activities would range from minor to moderate, depending on which, if any, of the construction projects occurred simultaneously. Activities related to the construction of the reasonably foreseeable projects could result in a short-term, minor to moderate, adverse impact to visitation and visitor spending at local businesses in the project area.

Collectively, the cumulative projects discussed above would have a long-term, minor to moderate, beneficial impact to visitation and visitor spending at local businesses within the project area.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would result in a long-term, minor to moderate, beneficial cumulative impact on economic conditions in the project area.

Conclusions. Alternative 2 would have short-term negligible beneficial construction related economic impacts and long-term negligible beneficial operations related economic impacts on the San Francisco economy. Alternative 2 would also have no cumulative impact on other reasonably foreseeable future projects.

4.4 TRANSPORTATION AND CIRCULATION

4.4.1 Methodology and Assumptions

The focus of this impact assessment was on the effect of changes in the project area to transit service, parking facilities and conditions, transit operations, travel lanes, traffic circulation and associated traffic flow and safety conditions. It was assumed that the Project would result in quantifiable construction activity, the effects of which were assessed. It also was assumed that the context of project effects would be local (i.e., those that would occur within the project study area), as opposed to regional (i.e., those that would occur outside the project study area).

Although quantitative analysis of potential effects was conducted for the impact assessment of the effects of changes in travel lanes on traffic flow, and of changes in parking facilities on parking conditions, the nature of analysis of effects on traffic safety (i.e., the uncertainty of consequences of an increase in potential vehicle conflicts) does not lend itself to quantification, and professional transportation engineering judgment was applied to reach reasonable conclusions as to the context, intensity, and duration of potential impacts. When possible, mitigation measure(s) were incorporated into the Project to reduce the intensity of adverse effects.

Transit Operations. This section assessed changes to transit services associated with extension of the F-line streetcar that could result from each of the action alternatives (and configuration options). Changes to transit services were then judged as to whether they would substantially change the mix of transportation modes (autos and transit) serving the project area.

Traffic Flow Conditions. This section assessed changes in travel lanes associated with accommodation of the F-line in roadway right-of-way that could result from each of the action alternatives (and configuration options). Changes in travel lanes were then judged as to whether they would substantially change the levels of congestion (average vehicle delay) on the roadway system serving the project area.

Parking Conditions. This section assessed potential changes in lane configuration associated with accommodation of the F-line in roadway right-of-way that could result from each of the action alternatives (and configuration options). Changes in lane configuration were then judged as to whether they would substantially change the availability of on-street parking spaces serving the project area. Parking conditions at the Fort Mason Center were also addressed. In addition, this section addresses concerns expressed by project area residents about North Bay-based motorists driving across the Golden Gate Bridge to park in the area and use the F-Line to continue on to downtown destinations.

Traffic Safety/Conflicts. This section assessed potential changes in lane configuration associated with accommodation of the F-line in roadway right-of-way that would result from each of the action alternatives (and configuration options). Changes in travel lanes and availability of parking spaces were then judged as to whether increased levels of congestion (average vehicle delay) and decreased availability of on-street parking spaces would substantially affect the potential for traffic conflicts.

Impact Intensity	Impact Description
Negligible:	Effects considered not detectable which and would have no discernible effect on transit service, traffic flow, parking, and/or traffic safety conditions.
Minor:	Effects on transit service, traffic flow, parking, and/or traffic safety conditions that would be slightly detectable, but not expected to have an overall effect on those conditions.
Moderate:	Effects that would be clearly detectable, and could have an appreciable effect on transit service, traffic flow, parking, and/or traffic safety conditions.
Major:	Effects that would have a substantial, highly noticeable, influence on transit service, traffic flow, parking, and/or traffic safety conditions and could permanently alter those conditions.

4.4.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Under Alternative 1, the availability of parking spaces and the mix of transportation modes (autos and transit) serving the project area would remain similar to current conditions for all portions of the project study area. A San Francisco County Transportation Authority Travel Demand Model Run (August 2007) conducted for daily person trips to Fort Mason Center identified a mode split between automobiles and transit. The model predicted daily person trips to Fort Mason Center under the No Project for the year 2030 would be 71 percent via automobiles and 10 percent via transit (with the rest via walking or bicycle travel mode), the same as the 2005 mode split (URS 2009f).

Alternative 1 would not affect transit operation conditions.

Alternative 1 would not affect parking conditions.

Under Alternative 1, although not quantified, it is reasonable to expect that traffic volumes would increase on the streets serving the project area. The current traffic control (signals and stop signs) would remain the same, and as a result, the level of congestion (average vehicle delay), particularly at unsignalized intersections, would be expected to increase. It is also reasonable to expect that the potential for conflicts between different traffic streams would increase due to the increased traffic congestion and the unchanged traffic control at area intersections.

The operation-related effects on traffic flow conditions would be long-term, minor and adverse.

The operation-related effects on traffic safety conditions would be long-term, minor, and adverse.

Cumulative Impacts. Cumulative effects to transportation are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect transit operations, traffic flow, traffic safety and/or parking conditions within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on transportation include the Presidio Transit Program, the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fisherman's Wharf Public Realm Plan, Van Ness Bus Rapid Transit, E-Embarcadero Historic Streetcar Line, and SFMTA's Transit Effectiveness Project. The beneficial

impacts would result from increased use of public transit (with a corresponding decrease use of private automobiles). The degree of travel mode shift away from private automobiles is not certain. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to transit operations, traffic flow, traffic safety and/or parking conditions within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive could result in short-term adverse impacts on transportation. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-generated traffic on roadways serving the project sites. Construction activities would increase traffic on local roadways, both from equipment and material haul trips and commute trips by construction workers. The intensity of the adverse effects from the construction-related traffic would range from minor to moderate, depending on which, if any, of the construction projects occurred simultaneously. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to traffic flow.

Collectively, the cumulative projects discussed above would have a long-term, minor to moderate, beneficial impact to transit operations, traffic flow, traffic safety and/or parking conditions within the project area.

The impacts of Alternative 1, when combined with the impacts of the cumulative projects described above, would result in a long-term, minor, beneficial cumulative impact on transportation conditions in the project area.

Conclusions. Alternative 1 would have long-term, minor, adverse impacts to traffic flow and traffic safety conditions, and would cause no impacts to transit operations and parking conditions.

4.4.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. As stated above, the focus of this impact assessment was on the effect of changes in the project area to transit service, parking facilities and conditions, transit operations, travel lanes, traffic circulation and associated traffic flow and safety conditions. Alternative 2 would construct an extension of the F-Line on an alignment consisting of four segments (i.e., Fort Mason Turnaround Segment, Tunnel Segment, Transition Segment, and In-Street Segment). Effects of Alternative 2 on transit operations (defined as changes to the area served by transit and changes to the mix of transportation modes [autos and transit] serving the project area) were assessed on the basis of the full proposed action (i.e., the above-cited four segments as a whole). The effects of Alternative 2 on traffic flow conditions were assessed for the In-Street segment only. The effects of Alternative 2 on traffic safety and parking conditions were assessed for the Fort Mason Turnaround, Transition, and In-Street segments. The Alternative 2 transportation impacts are presented in the order of impact topic after a description of the construction impacts of the overall Alternative 2.

Construction Impacts. The construction effort for Alternative 2 would have short-term, adverse transportation impacts during the 18- to 24-month construction period. The intensity and nature of the construction activity would vary over the construction period, and the range of adverse impacts to traffic flow, traffic safety, and parking conditions would similarly vary. Adverse construction-related transportation impacts would primarily relate to temporary increases in traffic volumes (including heavy trucks) on area roadways, and displaced on-street parking spaces to accommodate staging areas and/or parking demand by construction workers.

Construction activities would generate varying numbers of vehicle trips (depending on the type of work) to accommodate construction workers, trucks, and equipment. Construction-related truck trips would be dispersed throughout the day, and although they would cause a temporary and intermittent lessening of the capacities of area roadways because of the slower movements and larger turning radii of construction trucks compared to passenger vehicles, those trips would fall within the daily fluctuations of traffic volumes on affected roadways, causing short-term, minor, adverse impacts on traffic flow conditions in the project area. Construction activities for the in-street segment would be phased to retain some access to each street block at all times. Traffic might be re-routed temporarily, which would be an inconvenience to motorists, but the street grid system would minimize the impact. Loading/unloading of delivery trucks may be temporarily relocated.

Construction-related truck traffic would cause a temporary and slightly detectable increase in potential conflicts between different traffic streams because of the slower movements and larger turning radii of construction trucks compared to passenger vehicles.

Construction on the in-street segment would occur on one side of the road at a time. In addition, staging areas would be required to store materials and equipment for the Project, and parking spaces would be required to accommodate construction worker vehicles. The size and location of staging areas is expected to vary throughout the Project duration. To the degree that staging areas and parking spaces displace existing on-street parking spaces, the Project would have short-term, minor, adverse impacts on parking conditions. If the North Loop Turnaround option were selected, construction activities at the Fort Mason terminal would be performed in phases to minimize the loss of parking spaces at Fort Mason Center.

Construction of the crossing of the cable car line at Hyde Street would require phased closures of portions of the roadway and the intersection of Hyde and Beach Streets. Work would require the closure of the Powell/Hyde cable car line for up to one month, and additional cable cars would run on the Powell/Mason line as replacement service for tourists. For people who use the Powell/Hyde cable cars for commute purposes, a bus substitution would operate on the Powell/Hyde route (between Market Street and Hyde Street). It is anticipated that closure of the Powell/Hyde cable car line would occur during non-holiday, non-peak-tourist seasons.

Best Management Practices would be employed to reduce transportation effects and would be made conditions of agreements with contractors. Generally, these practices include implementation of a traffic control plan, which would involve measures (e.g., advance warning signs, and flaggers to direct traffic) to maintain safe and efficient traffic flow during the construction period. The mitigation measures would lessen the magnitude of the adverse construction-related impacts to traffic safety to a negligible level.

Effects on Transit Operation Conditions

Overall Alternative 2 (all segments). Alternative 2 would extend public transit service to Fort Mason Center (with interim stops in the Fisherman's Wharf area beyond the existing terminal for the F-Line). The extension of service would accommodate people who otherwise would travel to Fort Mason Center via private automobile or other non-transit modes of travel. The 28-19th Avenue Muni bus currently serves Fort Mason Center, but that bus line serves only the west side of San Francisco. The F-Line extension would connect Fort Mason Center to the downtown area of San Francisco, and the multiple connection possibilities with other Muni lines and regional transit service (e.g., BART, AC Transit, and SamTrans) in the downtown area.

Changes to the mix of transportation modes [autos and transit] serving the project area resulting from Alternative 2 were predicted using the Travel Demand Model Run (URS 2009f). These results identified a 14.4 percent increase in transit use for daily person trips to Fort Mason Center between the No Project and implementation of the Project with the F-line extension. The result would be a long-term, moderate, beneficial impact.

Effects on Traffic Flow Conditions

In-Street Segment. The in-street segment would extend from the transition area at Beach and Polk Streets easterly to Jones Street, where it would connect with the existing F-Line. East of Leavenworth Street, the eastbound alignment would continue on Beach Street to the aforementioned connection, while the westbound alignment would extend from the existing F-Line on Jefferson Street, turn left onto Leavenworth Street and turn right onto Beach Street.

Alternative 2 would alter the manner in which automobiles and trucks would be accommodated on streets within the in-street segment. One option would consist primarily of shared auto/streetcar operation (the exception being along one-way [westbound] Jefferson Street, where semi-exclusive streetcar operation would be used), and a second option would consist of semi-exclusive streetcar operation for eastbound service and shared auto / streetcar operation for westbound service (again except along Jefferson Street, where semi-exclusive operation would be used). While it is possible to create a hybrid of the two options, having some semi-exclusive and some shared operation for eastbound service, for purposes of this analysis, the two options have been evaluated separately.

For the Semi-Exclusive Option, potential changes to the lane configurations at area intersections are described below (there would be no change to the existing lane configuration at Intersections 6 [Beach Street and Larkin Street] and 7 [Beach Street and Polk Street]). Intersections described below are depicted on Figure 3.4-3.

1. Jefferson Street and Jones Street – the westbound approach would change from one through lane and one left-turn/through lane to one through lane and one left-turn lane.
2. Beach Street and Jones Street – the eastbound approach would change from two through lanes (one left-turn/through lane and one through/right-turn lane) to one through lane (combined left-turn/through/right-turn).

3. Beach Street and Hyde Street – the eastbound approach would change from two through lanes (one through lane and one through/right-turn lane) to one through lane (combined through/right-turn).

4. Jefferson Street and Leavenworth Street – the westbound approach would change from two through lanes (one left-turn/through lane and one through/right-turn lane) to one through lane (combined left-turn/through/right-turn).

5. Beach Street and Leavenworth Street – the eastbound approach would change from two through lanes (one left-turn/through lane and one through/right-turn lane) to one through lane (combined left-turn/through/right-turn).

8. Beach Street and Columbus Avenue – the eastbound approach would change from one through lane and one through/right-turn lane to one through lane and one right-turn lane.

For the Shared Lane Option, potential changes to the lane configurations at area intersections are described below (there would be no change to the existing lane configuration at Intersections 1 [Jefferson Street and Jones Street] and 7 [Beach Street and Polk Street]). Intersections described below are depicted on Figure 3.4-3.

2. Beach Street and Jones Street – the eastbound approach would change from two through lanes (one left-turn/through lane and one through/right-turn lane) to one through lane (combined left-turn/through) and a separate right-turn lane.

3. Beach Street and Hyde Street – the eastbound approach would change from two through lanes (one through lane and one through/right-turn lane) to one through lane (right turns would be prohibited).

4. Jefferson Street and Leavenworth Street – same change as described above for Semi-Exclusive Option.

5. Beach Street and Leavenworth Street – the eastbound approach would change from two through lanes (one left-turn/through lane and one through/right-turn lane) to one through lane (through/right-turn) and a separate left-turn lane. In addition, the westbound approach would retain the one through lane, but would be a through/right-turn lane, with the addition of a separate left-turn lane.

6. Beach Street and Larkin Street – the left-turn/through lane on the westbound approach would be split into one through lane and a separate left-turn lane.

8. Beach Street and Columbus Avenue – same change as described above for Semi-Exclusive Option.

Streetcar movements would be governed by line-of-sight operations, except at intersections, where movements would be controlled by traffic signals. The following three unsignalized intersections would be signalized as part of Alternative 2 (under both Semi-Exclusive and Shared Lane options).[1] Intersections described below are depicted on Figure 3.4-3.

4. Jefferson Street and Leavenworth Street

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[1] The new traffic signals, and modifications to existing signals, would be funded as part of the project.

5. Beach Street and Leavenworth Street (a protected left-turn phase for east-west traffic under the Shared Lane Option only)

7. Beach Street and Polk Street

Each of the new signals would have a dedicated transit-only phase (which is skipped if no transit actuation is detected).[2] At the intersection of Jefferson Street and Jones Street, where on occasion there is a backup of streetcars from the existing Jones Street terminal (when there are three or four streetcars at the terminal at the same time), the configuration of the F-Line extension would include a turnout that allows a streetcar continuing straight on Jefferson Street to pass a streetcar turning onto Jones Street.[3]

An LOS analysis was performed for the eight study intersections under Alternative 2 conditions. No attempt was made to quantify the reduction in automobile traffic volumes that would occur if the F-Line were extended to Fort Mason Center, though as described above, it is reasonable to expect that under Alternative 2, people would shift from using their private automobile to using other modes of travel including the F-Line to travel to and from Fort Mason Center. In addition, the analysis of LOS conditions under Alternative 2 does not attempt to quantify the degree to which the Fisherman's Wharf Public Realm Plan would divert traffic off Jefferson Street onto other streets in the area.[4] The effects of Alternative 2 on traffic flow conditions were judged on the basis of the above-described changes to the lane configurations and to the traffic control at the intersections, which provides a conservative analysis of the effects on Alternative 2 on traffic flow conditions. As shown in **Tables 4.4-1** and **4.4-2**, all except one of the study intersections would continue to operate at acceptable LOS during both the weekday p.m. and weekend midday peak hours under both the Semi-Exclusive and Shared Lane options. During the weekend midday peak hour, the Jefferson/Leavenworth Streets intersection would operate at an unacceptable LOS F (high delay experienced by the average motorists) under both the Semi-Exclusive and Shared Lane options (weekday p.m. peak-hour conditions would be acceptable).

Design concepts under consideration for the Fisherman's Wharf Public Realm Plan would designate Jefferson Street a Pedestrian Priority Street, and would reduce vehicle traffic volumes on Jefferson Street through wayfinding signage, and sidewalk and pavement design features. As stated above, no attempt was made to quantify the lower traffic volume on Jefferson Street resulting from the Public Realm Plan. However, the weekend midday peak-hour LOS F condition at the Jefferson/Leavenworth Streets intersection would improve to an acceptable LOS D or better if reduced by 33 percent or more. Strategies currently under consideration to reduce the number of vehicles on Jefferson Street during peak periods of activity at the Wharf focus on two options, (1) to limit the volume to 100 vehicles per hour, or (2) to effectively eliminate vehicles on Jefferson Street. In either case, the percent reduction during the weekend midday peak hour would be greater than 33 percent, and the level of service would be LOS D or better. The result with implementation of the Public Realm Plan would be a long-term, minor, adverse impact, and without implementation of the Public Realm Plan would be a long-term, major, adverse impact.

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[2] The LOS analysis prepared for this analysis assumed that the transit-only phase would occur during every signal cycle, ensuring a conservative assessment of LOS conditions for Alternative 2.

[3] See Draft Conceptual Engineering Report, January 22, 2009.

[4] The Fisherman's Wharf Public Realm Plan is an inter-agency partnership, led by the San Francisco Planning Department; the Draft Plan was released in June 2010.

TABLE 4.4-1: EXISTING AND EXISTING PLUS ALTERNATIVE 2 WEEKDAY PM PEAK-HOUR LEVEL OF SERVICE (LOS) AND AVERAGE DELAY

Intersection	Traffic Control[a]	Existing		Existing + Alt. 2	
		LOS	Delay[b]	LOS	Delay[b]
1. Jefferson Street and Jones Street	Signal	C	20.2		
(Semi-Exclusive Option)				C	21.3
(Shared Lane Option)				C	20.6
2. Beach Street and Jones Street	Signal	B	13.1		
(Semi-Exclusive Option)				B	12.2
(Shared Lane Option)				B	12.3
3. Beach Street and Hyde Street	Signal	B	12.1		
(Semi-Exclusive Option)				B	12.3
(Shared Lane Option)				B	12.3
4. Jefferson Street and Leavenworth Street	AWSC/ Signal	A	8.4		
(Semi-Exclusive Option)				D	35.1
(Shared Lane Option)				D	36.6
5. Beach Street and Leavenworth Street	AWSC/ Signal	A	8.8		
(Semi-Exclusive Option)				B	17.1
(Shared Lane Option)				C	24.1
6. Beach Street and Larkin Street	SSSC[c]	A	8.7		
(Semi-Exclusive Option)				A	8.7
(Shared Lane Option)				A	8.2
7. Beach Street and Polk Street	SSSC[c]/ Signal	A	8.3		
(Semi-Exclusive Option)				C	23.2
(Shared Lane Option)				C	23.2
8. Beach Street and Columbus Avenue	SSSC[c]	A	8.1		
(Semi-Exclusive Option)				A	8.2
(Shared Lane Option)				A	8.2

[a] AWSC is an unsignalized intersection with All-Way Stop-Control, and SSSC is an unsignalized intersection with Side-Street Stop-Control. If two traffic control types (e.g., AWSC/Signal) are shown, then the top type is the current traffic control, and the bottom type would be the traffic control under Alternative 2.
[b] The LOS and delay represent conditions for the overall intersection.
[c] This intersection was analyzed as AWSC because, from field observations, it was noted that most of the vehicles on the major (uncontrolled) street come to a full stop due to high pedestrian crossing volumes.

SOURCES: Wilbur Smith Associates and ESA

Effects on Traffic Safety Conditions

In-Street Segment. As described above, Alternative 2 would degrade the weekend midday peak-hour traffic level of service (LOS) to an unacceptable condition (LOS F, with high delay experienced by the average motorists) at one intersection (Jefferson Street at Leavenworth Street) under both track configuration options (i.e., Semi-Exclusive and Shared Lane). All other study intersections would operate at acceptable service levels during the weekend midday peak hour, and weekday p.m. peak-hour LOS would be acceptable at all study intersections. However, the poor LOS at Jefferson/ Leavenworth during the weekend midday peak hour would not substantially affect the potential for traffic conflicts because the traffic signal phasing would effectively remove conflicts among the different traffic streams (i.e., the

TABLE 4.4-2: EXISTING AND EXISTING PLUS ALTERNATIVE 2 WEEKEND MIDDAY PEAK-HOUR LEVEL OF SERVICE (LOS) AND AVERAGE DELAY

Intersection	Traffic Control[a]	Existing		Existing + Alt. 2	
		LOS	Delay[b]	LOS	Delay[b]
1. Jefferson Street and Jones Street	Signal	C	23.0		
(Semi-Exclusive Option)				C	26.2
(Shared Lane Option)				C	23.4
2. Beach Street and Jones Street	Signal	C	25.1		
(Semi-Exclusive Option)				C	23.1
(Shared Lane Option)				C	25.3
3. Beach Street and Hyde Street	Signal	C	20.1		
(Semi-Exclusive Option)				C	23.8
(Shared Lane Option)				C	21.8
4. Jefferson Street and Leavenworth Street	AWSC/ Signal	B	10.3		
(Semi-Exclusive Option)				**F**	**148.0**
(Shared Lane Option)				**F**	**146.8**
5. Beach Street and Leavenworth Street	AWSC/ Signal	C	19.3		
(Semi-Exclusive Option)				C	23.7
(Shared Lane Option)				D	35.6
6. Beach Street and Larkin Street	SSSC[c]	C	16.4		
(Semi-Exclusive Option)				C	16.4
(Shared Lane Option)				B	12.3
7. Beach Street and Polk Street	SSSC[c]/ Signal	B	12.0		
(Semi-Exclusive Option)				C	28.7
(Shared Lane Option)				C	28.7
8. Beach Street and Columbus Avenue	SSSC[c]	B	12.1		
(Semi-Exclusive Option)				C	15.3
(Shared Lane Option)				C	15.2

[a] AWSC is an unsignalized intersection with All-Way Stop-Control, and SSSC is an unsignalized intersection with Side-Street Stop-Control. If two traffic control types (e.g., AWSC/Signal) are shown, then the top type is the current traffic control, and the bottom type would be the traffic control under Alternative 2.

[b] The LOS and delay represent conditions for the overall intersection.

[c] This intersection was analyzed as AWSC because, from field observations, it was noted that most of the vehicles on the major (uncontrolled) street come to a full stop due to high pedestrian crossing volumes.

SOURCES: Wilbur Smith Associates and ESA

signal phases for automobile/truck/pedestrian/bicycle traffic and for streetcars). This would result in a long-term, negligible, adverse impact.

Transition Segment. Alternative 2 would introduce locations along the track alignment as it leaves the Aquatic Park area and crosses Van Ness Avenue to the east portal of the Fort Mason Tunnel where automobiles, bicyclists and pedestrians would have to cross (on Bicycle Route 2 and sidewalks). Van Ness Avenue traffic (vehicular and bicycle) crossing the track would be controlled by stop signs, and positive wayfinding devices (e.g., signs and pavement markings) would alert pedestrians of the presence of possible streetcar movements. Given the planned frequency of streetcar service (as frequent as every six minutes), the above-cited traffic control devices, and the clear view that bicyclists and pedestrians

would have of the streetcars as they approach the crossings, Alternative 2 would not substantially affect the potential for traffic conflicts. This would result in a long-term, minor, adverse impact.

North Loop Option. Although subject to final design, it is expected that Alternative 2 would introduce locations along the track loop in the Fort Mason Center where automobiles would have to cross as people drive to parking spaces, and to leave Fort Mason Center from those parking spaces (see Figure 2-3). Those locations would be controlled by stop signs on the automobile approaches to the crossings. Similarly, there would be potential conflicts between bicyclists and streetcars. However, given the planned frequency of streetcar service (as frequent as every six minutes) and the clear view that motorists and bicyclists would have of the streetcars as they approach the crossings, Alternative 2 would not substantially affect the potential for traffic conflicts. Also, pedestrians (including people who travel on the streetcars or in automobiles to/from Fort Mason Center) would potentially walk across the tracks, especially people (e.g., tourists) who could be unfamiliar with their surroundings. Provision of positive wayfinding devices (e.g., signs and pavement markings) would reduce the potential adverse effects. This option would result in a long-term, minor, adverse impact.

South Loop Option. Although subject to final design, and not depicted on Figure 2-4, Alternative 2 would realign a portion of the San Francisco Bay Trail to accommodate the F-Line platform. The affected segment of the Bay Trail currently connects to the sidewalk at the intersection of Laguna Street and Marina Boulevard near the Fort Mason Center gatehouse, a constrained area where pedestrians and bicyclists (some of the latter traveling at excessive speeds down the slope of the Bay Trail) converge. Alternative 2 would realign the Bay Trail to follow an area of the Great Meadow above the track loop and connect to the sidewalk along Laguna Street south of Marina Boulevard. The proposed realignment of the Bay Trail would have a beneficial effect on the potential for traffic conflicts.

Also, people who travel on the streetcars to/from Fort Mason Center would potentially walk through the existing Fort Mason Center parking lot between the platform and their origin / destination, especially people (e.g., tourists) who could be unfamiliar with their surroundings. Provision of positive wayfinding devices (e.g., signs and pavement markings) would reduce the potential adverse effects. This option would result in a long-term, minor, beneficial impact.

Effects on Parking Conditions. The City and County of San Francisco does not consider parking supply as part of the permanent physical environment and therefore, does not consider changes in parking conditions to be environmental impacts. It is acknowledged, however, that parking conditions may be of interest to the public and the decision makers.

Parking conditions are not static, as parking supply and demand varies from day to day, from day to night, from month to month, etc. Hence, the availability of parking spaces (or lack thereof) is not a permanent physical condition, but changes over time as people change their modes and patterns of travel. Parking deficits are considered to be social effects, rather than impacts on the physical environment. The social inconvenience of parking deficits, such as having to hunt for scarce parking spaces, is not an environmental impact, but there may be secondary physical environment impacts, such as increased traffic congestion at intersections, air quality impacts, safety impacts, or noise impacts caused by congestion. However, the absence of a ready supply of parking spaces, combined with available alternatives to auto travel and a relatively dense pattern of urban development, induces many

drivers to seek and find alternative parking facilities, shift to other modes of travel, or change their overall travel habits. Resulting shifts to transit service in particular would be in keeping with the City's "Transit First" policy. The City's Transit First Policy, established in the City's Charter Article 8A, Section 8A.115, provides that "parking policies for areas well-served by public transit shall be designed to encourage travel by public transportation and alternative transportation." As described above, it is reasonably expected that Alternative 2 would result in people shifting from use of their private automobile to use of other modes of travel including the F-Line, and that the degree of that shift in travel mode would be clearly detectable.

In-Street Segment. Under Alternative 2, on-street parking spaces would be removed along the following locations in order to accommodate (a) the streetcar tracks and platforms, and (b) turn lanes for automobile/truck traffic:

Semi-Exclusive Option (a total of 117 spaces would be removed):

- Beach Street west of Polk Street - all spaces (24 general parking) along the north side
- Beach Street between Polk and Larkin Streets – all spaces (12 metered, 1 truck loading, and 4 passenger loading) along the south side
- Beach Street between Larkin and Hyde Streets – all spaces (16 metered, and 2 truck loading) along the south side, and half of the spaces (9 metered) along the north side
- Beach Street between Hyde and Leavenworth Streets – all spaces (7 metered, 3 passenger loading, and 1 disabled) along the north side
- Leavenworth Street between Jefferson and Beach Streets – all spaces (3 metered, and 8 truck loading) along the west side, and half of the spaces (3 truck loading, and 2 passenger loading) on the east side
- Jefferson Street between Leavenworth and Jones Streets – all spaces (9 metered, and 2 passenger loading) along the north side
- Jefferson Street between Jones and Taylor Streets – all of the spaces (9 metered, and 2 passenger loading) along the north side

This option would result in a long-term, minor, adverse impact.

Shared Lane Option (a total of 85 spaces would be removed):

- Beach Street west of Polk Street - all spaces (24 general parking) along the north side
- Beach Street between Polk and Larkin Streets – no spaces
- Beach Street between Larkin and Hyde Streets - half of the spaces (7 metered, and 2 truck loading) along the south side, and half of the spaces (9 metered) along the north side
- Beach Street between Hyde and Leavenworth Streets - half of the spaces (5 metered) along the north side
- Leavenworth Street between Jefferson and Beach Streets – all spaces (3 metered, and 8 truck loading) along the west side, and half of the spaces (3 truck loading, and 2 passenger loading) on the east side

- Jefferson Street between Leavenworth and Jones Streets – all spaces (9 metered, and 2 passenger loading) along the north side
- Jefferson Street between Jones and Taylor Streets – all of the spaces (9 metered, and 2 passenger loading) along the north side

This option would result in a long-term, minor, adverse impact.

As described above for individual street segments, depending on the configuration option, a total of 13 or 14 truck loading spaces, and 6 or 13 passenger loading spaces, would be removed. Under either option, it is anticipated that SFMTA would reconfigure the remaining on-street parking spaces (e.g., change general metered spaces to metered truck loading spaces or passenger loading spaces) to minimize the incidence of double parking caused by removal of truck loading and passenger loading spaces under either option. Fisherman's Wharf Public Realm Plan contains parking management policies to provide more efficient use of the existing parking garages. Dynamic signage with real-time parking information will be used to direct drivers to those garages with the greatest number of available parking spaces.

Transition Segment. The Alternative 2 track alignment would cross Van Ness Avenue as it transitions from the Aquatic Park area to the east portal of the Fort Mason Tunnel. There are parking spaces on Van Ness Avenue near, but not across, the track alignment in this area. These parking spaces would not be affected by the Project. Alternative 2 would not affect parking conditions in the Transition Segment.

North Loop Option. Alternative 2 would reduce the parking supply at Fort Mason Center because of the area displaced by the streetcar tracks, platforms and associated facilities by approximately 35 spaces. Given that, as described above, it is reasonably expected that Alternative 2 would result in a clearly detectable shift from use of private automobile to use of other modes of travel including the F-Line, the effect of Alternative 2 could be slightly detectable, but would not be expected to have an overall effect on parking conditions. There would be a long-term, minor, adverse impact.

South Loop Option. Alternative 2 would not affect parking conditions at Fort Mason Center, and would not displace any parking spaces resulting in no impact.

Overall Alternative 2 (all segments). Alternative 2 would extend public transit service, connecting Fort Mason Center and downtown. Concerns have been raised about the possibility that North Bay-based motorists would drive across the Golden Gate Bridge to park in the area and use the F-Line to continue on to downtown destinations. Parking on Marina Boulevard and on the street network south of the marina area is restricted to two hours between 8:00 a.m. and 6:00 p.m. (Monday through Friday) for nonresidents. Residents (with residential zone "M" parking permits) have no time limit. Because of its proximity to the Fort Mason Center, people could seek parking spaces at the marina and then walk to reach the F-Line. The effect could be adverse if large numbers of people search parking at the marina, creating traffic congestion at local intersections, but it is speculative to quantify. The overall impact would be long-term, minor and adverse.

Cumulative Impacts. The impacts of the other actions (past, present, and reasonably foreseeable future actions) for transportation under Alternative 2 would be the same as described under Alternative 1. See the discussion of cumulative effects under Alternative 1.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a local, long-term, moderate, beneficial cumulative impact on transportation conditions in the project area. The local, short-term, minor to moderate, adverse impact on transportation conditions from Project construction activities would be offset by the beneficial impacts of the cumulative projects. The local, long-term, moderate, beneficial effect on transit operations would be enhanced by the beneficial impacts of the cumulative projects. The long-term, negligible to minor, adverse effects on traffic flow and safety, and the long-term, minor, adverse effects on parking conditions, would be offset by the beneficial impacts of the cumulative projects.

Mitigation Measures

TRANS-1: Optimize Traffic Signal Timing. SFMTA would optimize the traffic signal timing for weekend conditions at the intersection of Jefferson Street and Leavenworth Street to reduce overall vehicle delays, while accommodating the F-Line streetcars and pedestrian circulation. As described above, no attempt was made to quantify the reduction in automobile traffic volumes that would occur if the F-Line were extended to Fort Mason Center, or from the Public Realm Plan, which provides a conservative analysis of the effects on Alternative 2 on traffic flow conditions. As also described above, strategies are currently under consideration to reduce the number of vehicles on Jefferson Street during peak periods of activity at the Wharf to no more than 100 vehicles per hour. Such a reduction in automobile traffic would improve the level of service at Jefferson/Leavenworth Streets to an acceptable LOS D or better during the weekend midday peak hour. The result with implementation of the Public Realm Plan (i.e., LOS D or better) would be a long-term, minor, adverse impact, but without implementation of the Public Realm Plan, the expectation is that the intersection LOS would remain at an unacceptable level (i.e., worse than LOS D), and the long-term, major, adverse impact would remain.

TRANS-2: Install Wayfinding Devices. Provision of positive wayfinding devices (e.g., signs and pavement markings) would reduce the potential adverse effects of potential traffic conflicts.

TRANS-3: Reconfigure On-Street Parking Spaces. SFMTA would reconfigure on-street parking spaces in the in-street segment (e.g., change general metered spaces to metered truck loading spaces) to minimize the incidence of double parking caused by removal of truck loading spaces under either the Semi-Exclusive and Shared Lane options. In addition, as described above, the Public Realm Plan contains parking management policies to use dynamic signage with real-time parking information to direct drivers to available parking spaces in area garages.

TRANS-4: Implement Parking Time Restrictions. Implementation of time limitations on the parking spaces in the marina lot in proximity to the Fort Mason Center would reduce the potential adverse effects of North Bay-based motorists driving across the Golden Gate Bridge to park in the area to use the F-Line to continue on to downtown destinations.

Conclusions. Alternative 2 would have a short-term, minor, adverse impact, and long-term, negligible, adverse impacts on transportation conditions in the project area.

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4.5 AIR QUALITY

4.5.1 Methodology and Assumptions

Project-related air quality impacts fall into two categories: impacts due to construction, and impacts due to Project operation. First, during Project construction, the Project would increase regional pollutants of reactive organic gases (ROG) and oxides of nitrogen (NOx) as well as local particulate concentrations primarily due to fugitive dust sources. Over the long-term, the Project would result in a decrease in emissions primarily due to decreased motor vehicle trips resulting from greater public transit access provided by the Project. This Project would not include any onsite stationary or area sources (such as natural gas boilers for water and space heating, and emissions from landscaping and use of consumer products).

Air quality assessment methodologies in this section generally conform to those identified by the Bay Area Air Quality Management District (BAAQMD) in its newly updated 2010 California Environmental Quality Act (CEQA) Air Quality Thresholds and Guidelines.

Construction-related Impacts. For construction phase-related impacts, BAAQMD's 2010 CEQA Air Quality Thresholds and Guidelines establish exhaust-related significance thresholds of 54 pounds per day of ROG, NOx, and fine particulate patter (PM2.5) and 82 pounds per day for PM10. Based on this guidance, construction emissions are calculated using RoadMod because of the linear nature of the Project improvements and compared to the proposed significance thresholds in this EIS (see Appendix E).

Impact Intensity	Impact Description
Negligible:	The area of construction activity would not change from the area disturbed under the No-Action Alternative.
Minor:	The Alternative would involve less than 10,000 cubic yards of soil export or import by truck.
Moderate:	The Alternative would involve more than 10,000 cubic yards of soil export or import by truck.
Major:	Alternative construction would result in average construction exhaust emissions exceeding 54 pounds per day of ROG, NOx, or PM2.5 or 82 pounds per day of PM10.

Type	
Beneficial	Beneficial impacts would reduce vehicle trip generation and its associated pollutant emissions and by reducing levels of congestion (average vehicle delay), and occurrences of vehicle idling.
Adverse	Adverse impacts would increase pollutant emissions by introducing new emission sources or increasing vehicle miles travelled in the region.

Operational-related Impacts. The Project would result in a decrease in vehicle miles travelled in the region resulting from an increase in access to public transit. This decrease in vehicle travel would reduce criteria air pollutant emissions in the region.

Impact Intensity	Impact Description
Negligible:	The Alternative would not increase vehicle miles travelled in the region or increase electrical demand.
Minor:	The Alternative would increase daily emissions of ROG, NOx or PM2.5 by less than 10 pounds per day, emissions of PM10 by less than 15 pounds per day or emissions of greenhouse gases by less than 200 metric tons per year.
Moderate:	The Alternative would increase daily emissions of ROG, NOx or PM2.5 by less than 27 pounds per day, emissions of PM10 by less than 41 pounds per day or emissions of greenhouse gases by less than 550 metric tons per year.
Major:	The Alternative would increase daily emissions of ROG, NOx or PM2.5 by more than 54 pounds per day, emissions of PM10 by more than 82 pounds per day or emissions of greenhouse gases by more than 1,100 metric tons per year.

4.5.2 Impacts of Alternative 1—No-Action Alternative

Construction. Alternative 1 would not require the construction of any new roadway, transit or utility improvements. No new local or regional short-term, construction related impacts to air quality or greenhouse gas emissions would occur under Alternative 1.

Operation. New transit service would not be introduced under this alternative. Consequently, Alternative 1 would not have any beneficial air quality or greenhouse gas emission impacts related to vehicle trip reduction.

Because the roadway network, parking supply and transit service would not be altered under Alternative 1, there would be no traffic volume changes or other changes to the distribution of mobile source emissions within Fort Mason and the surrounding area under this Alternative. Therefore there would be no traffic-related air quality or greenhouse gas impacts.

Cumulative Impacts. There would be no incremental air quality or greenhouse gas emission impacts under Alternative 1. Therefore this Alternative would not contribute to any potential cumulative air quality or greenhouse gas impacts that may result from other development in the project area and surrounding area.

Conclusions. Alternative 1 would not propose the construction of any new roadway, transit or utility improvements and would therefore not result in any short- or long-term air quality or greenhouse gas emission impacts, either beneficial or adverse.

4.5.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Alternative 2A: North Loop Option. Alternative 2A would result in construction activities of approximately 8 weeks per block for advance utility work, followed by 6 weeks per block for track and rail installation. Construction work for the at-grade crossing of the Powell/Hyde Street cable car line would occur over a 6 month period as would the installation of new switches at Jones Street. Construction activities within the Fort Mason tunnel are anticipated to occur over a period of up to 12 months.

Construction emissions would be short-term (temporary) and would have the potential to result in adverse impacts to air quality. Air pollutant emissions would result from construction equipment and truck exhaust as well as from construction worker vehicle trips. Additionally, fugitive emissions of particulate matter would be generated by excavation and back-filling of trenches for utility installations and rails.

The Bay Area Air Quality Management District (BAAQMD) has recently adopted quantitative significance criteria for construction-related emissions. These quantitative thresholds are 54 pounds per day of either ROG, NOx, or fine particulate patter (PM2.5) and 82 pounds per day for PM10. These criteria are to be compared to exhaust emissions only. For emissions of particulate matter from fugitive dust, BAAQMD identifies the implementation of Best Management Practices as necessary to avoid an adverse air quality impact.

Construction emissions were calculated using RoadMod (see Appendix E) because of the linear nature of the Project improvements, as recommended by BAAAQMD guidance. Construction-related emissions for Alternative 2 as calculated by RoadMod are presented in **Table 4.5-1**. As can be seen from Table 4.5-1, emissions of NOx associated with construction activities would exceed BAAQMD significance criterion of 54 pounds per day. All other pollutants would be less than their associated significance thresholds. Therefore, construction-related NOx emissions represent a major adverse air quality impact. Exhaust emissions of all other pollutants would be considered minor adverse impacts.

TABLE 4.5-1: MAXIMUM DAILY CONSTRUCTION EMISSIONS OF CRITERIA AIR POLLUTANTS

Year	Estimated Daily Emissions (pounds per day)			
	ROG	NOx	PM10	PM2.5
2011	7.4	55.5	2.6	2.4
BAAQMD Threshold	54	54	82	54
Significant?	No	Yes	No	No
SOURCE: ESA, 2010.				

Additionally, mitigation measures in the form of Best Management Practices are required to avoid a major adverse air quality impact resulting from emissions of fugitive dust.

Construction-related GHG emissions were also calculated using RoadMod (see Appendix E) to estimate CO2 emissions and diesel emission factors for N2O and CH4 to estimate the additional contributions of these fractions. N2O and CH4 emissions were then multiplied by their global warming potential to determine construction-related GHG emissions in terms of CO2 equivalents (eCO2). Construction related GHG emissions are estimated at 431 metric tons of eCO2 per year and assume that all construction would occur in a single year. Construction-related GHG emissions would be short-term. The BAAQMD has not established a significance threshold for temporary construction-related GHG emissions. Therefore construction-related GHG emissions are considered a minor adverse impact with respect to global climate change.

The proposed extension of streetcar service that would occur under Alternative 2A is presumed to result in a net decrease in motor vehicle operations within the area which would result in a beneficial impact to air quality. Given that the streetcar extension would be powered by electricity, there would be no on-site emissions generation associated with the proposed action. Therefore, Alternative 2A would have a net negligible to minor beneficial operational air quality impact.

It is assumed that the Project would reduce vehicle trips into the Fort Mason area as a result of increased public assess to public transit. This reduction in vehicle trips would result in a reduction in GHG emissions from motor vehicles. While the proposed extension of streetcar service into Fort Mason would require an increase in electrical demand by the SFMTA, the indirect GHG emissions from this increased demand would likely be more than offset by the reduction in vehicle trips.

This likelihood is supported by the following assertions:

1. GHG emission factors for the electrical service provider (SFPUC) is one of the lowest in the state (40 pounds eCO2 per MWh[1] vs. a statewide average of 727 pounds eCO2 per MWh[2]); and
2. A single car trip of 10 miles per day generates over 3372 pounds eCO2 per year[3]. Consequently GHG emissions from an increase in electrical demand of 84 MWh, would be offset by a reduction of a single automobile trip per day.

Therefore, the Action Alternative is considered to result in a minor net beneficial impact to GHG emissions.

Alternative 2B: South Loop Option. From an air quality perspective, the south Loop Option would have the same magnitude of air quality emissions as the North Loop Option. The primary difference would be the location of activities for loop construction. The daily construction-related emissions for the South Loop Option would be the same as those presented in able 4.5-1. Emissions of NOx associated with construction activities would exceed BAAQMD significance criterion of 54 pounds per day. All other pollutants would be less than their associated significance thresholds. Therefore, construction-related NOx emissions represent a major adverse air quality impact. Exhaust missions of all other pollutants would be considered minor adverse impacts. Similar to the North Loop Option, mitigation measures in the form of Best Management Practices would be required to avoid a major adverse air quality impact resulting from emissions of fugitive dust.

The South Loop option would have exactly the same net minor adverse construction-related GHG emission impact with as would occur with the North Loop Option.

The extension of streetcar service that would occur under Alternative 2B South Loop Option is presumed to result in a net decrease in motor vehicle operations within the area which would result in a beneficial impact to air quality. Given that the service extension would be powered by electricity, there would be no on-site emissions generation associated with the Alternative 2. Therefore, the Alternative 2B South Loop Option would have a net minor beneficial operational air quality impact.

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[1] Ostrander, Calla, Climate Action coordinator, City of San Francisco Department of the Environment, e-mail communication, June 23, 2010.

[2] California Climate Action Registry General Reporting Protocol, Version 3.1, January 2009, Page 95.

[3] As calculated by the URBEMIS2007 model in conjunction with the BAAQMD BGM model.

The South Loop option would have exactly the same net minor beneficial impact with regard to GHG emissions as would occur with the North Loop Option.

Cumulative Impacts. Cumulative effects to air quality should consider the past present and reasonable foreseeable actions in the study area in addition to potential affects of Alternative 2. The projects identified include only those projects that could affect transit operations and thus air quality and greenhouse gas emissions within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on air quality and greenhouse gas emissions include the Presidio Transit Program, the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fisherman's Wharf Public Realm Plan, Van Ness Bus Rapid Transit, E-Embarcadero Historic Streetcar Line, and SFMTA's Transit Effectiveness Project. The beneficial impacts would result from increased use of transit (with a corresponding decrease use of private automobiles). The degree of travel mode shift away from private automobiles is not certain. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to air quality conditions within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive could result in short-term adverse impacts on air quality. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-generated traffic on roadways serving the project sites. The intensity of the adverse effects from the construction-related traffic would range from minor to moderate, depending on which, if any, of the construction projects occurred simultaneously. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to air quality and greenhouse gas emissions. Project construction emissions, with mitigation, would be less than BAAQMD significance thresholds. BAAQMD developed these thresholds to represent the levels at which a project's individual emissions of criteria air pollutants or precursors would result in a "cumulatively considerable contribution" to existing air quality (BAAQMD 2010). Therefore project construction-related emissions would not be considered to result in a significant cumulative impact.

Mitigation Measures

AIR-1: Implement BAAQMD Basic Construction Mitigation Measures. In order to avoid a major adverse impact to air quality as a result of localized emissions of fugitive dust during construction activity, the BAAQMD recommends that all projects implement Best Management Practices. BAAQMD identifies the following "Basic Construction Mitigation Measures" as recommended for all projects:

1. All exposed surfaces shall be watered two times daily.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.

3. All visible mud or dirt tracked-out onto adjacent public roads shall be removed using wet-power vacuum street sweepers at least once per day.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes. Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturers specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

In order to reduce daily emissions of NOx to below the 54 pounds per day threshold the contractor may employ any one of the following alternatives:

- Limit daily excavation and import volumes to 170 cubic yards, respectively; or
- Retrieve fill material from a local source within a 10-mile radius; or
- Dispose of excavated materials at a local depository within a 10 mile radius.

Conclusions. Short-term adverse air quality impacts would result from daily maximum construction activities. With implementation of BAAQMD best management practices for the control of construction-generated emissions as well as implementation of one of the three excavation/fill material mitigation measures, short-term air quality impacts would be minor to moderate and adverse.

Long-term air quality impacts under Alternative 2 would be associated with potential minor decreases in vehicle trip generation into the Fort Mason area and associated decreases in intersection traffic volumes. Therefore, Alternative 2 would result in negligible to minor beneficial operational impacts to both regional and local air quality as well as greenhouse gas emissions.

4.6 NOISE AND VIBRATION

4.6.1 Methodology and Assumptions

To assess potential short-term construction noise impacts, sensitive receptors and their relative exposure (considering topographic barriers and distance) were identified. Combined intermittent noise levels from the simultaneous operation of onsite equipment expected to be used in project construction were determined based on a study of measured construction equipment noise in the Roadway Construction Noise Model of the Federal Highway Administration, as indicated in **Table 4.6-1.** The sources in this list were identified as likely equipment to be used in the project.[1] An additional piece of equipment proposed to be used for which operational noise specifications are not available is a roadheader which is a device that would be used to cut concrete out of the tunnel. Because it would be used within the tunnel, its noise generation is assumed to be no greater than that of the concrete saw in Table 4.6-1.

Based on these noise levels and a typical noise attenuation rate of 6 dBA per doubling of distance, resultant noise levels at noise sensitive noise receptors were calculated. Consistent with the guidance for determination of construction noise impacts of the Federal Transit Administration (FTA)[2], impacts were assessed assuming simultaneous operation of the two noisiest pieces of construction equipment.

Long-term noise impacts would be associated with the introduction of street car operations in an area where none currently exist. Operational street car noise results from wheel and rail interactions as well as from warning bells. Braking operations are typically not noise generating. Prediction of noise and vibration impacts is assessed using noise and vibration measurement data[3] from adjacent areas where the streetcars currently run and adding this new noise to noise data for the existing environment where the new streetcar tracks are proposed to run.

There is also potential for beneficial noise reduction impacts that would result from the reduction in motor vehicle trips. Because the trip reduction for local roadways is not quantified, the associated reduction in vehicle road noise is also not quantified and assumed to be negligible.

Construction noise impact criteria is suggested in the Federal Transit Administration (FTA) Guidance which identifies a 1-hour Leq of 90 dBA for daytime and 80 dB for nighttime construction noise exposure at residential uses. Commercial and industrial land use exposure to construction noise of 100 dBA is suggested as assessment criteria. Additionally, the City of San Francisco noise ordinance prohibits the operation of any powered construction equipment emitting noise at a level in excess of 80 dBA at 100 feet, or an equivalent sound level at some other distance. This limit does not apply to impact tools and equipment, such as pile drivers, pavement breakers, and jackhammers, provided such equipment is fitted with approved noise control features.

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[1] Foster, Rick, National Park Service, e-mail communication to Darcey Rosenblatt of Environmental Science Associates, April 15, 2010.

[2] U.S. Department of Transportation, Federal Transit Administration, Traffic Noise and Vibration Impact Assessment, May 2006.

[3] Wilson Ihrig & Associates, Noise and Vibration Setting Report Historic Streetcar Service to Fort Mason, April 2009.

TABLE 4.6-1: MEASURED NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, Lmax at 50 feet)
Auger Drill Rig	84
Backhoe	78
Compactor	83
Air Compressor	78
Concrete Batch Plant	83
Concrete Mixer	79
Concrete Saw	90
Crane	81
Drill Rig Truck	79
Drum Mixer	80
Dump Truck	76
Excavator	81
Flat Bed Truck	74
Front End Loader	79
Generator	81
Grade All	83
Grapple (on Backhoe)	87
Jackhammer	89
Man Lift	75
Mounted Impact Hammer	90
Pickup Truck	75
Pneumatic Tools	85
Pumps	81
Rock Drill	81
Slurry Plan	78
Tractor	84
Ventilation Fan	79
Vibratory Concrete Mixer	80
Welder	74
SOURCE: Federal Highway Administration, *Roadway Construction Noise Model Handbook*, Chapter 9, August 2006.	

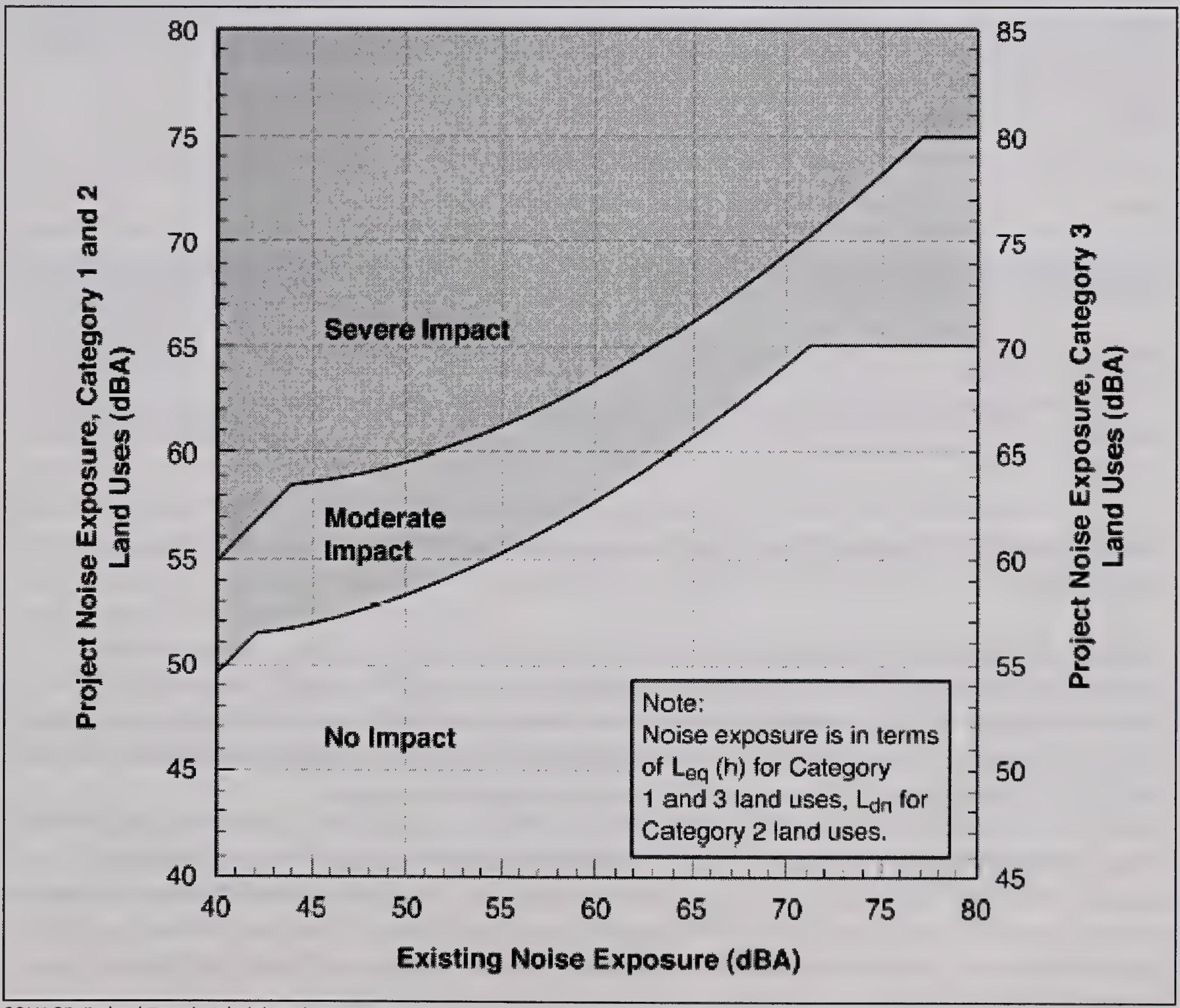
Operational noise impact severity is based on Federal Transit Administration (FTA) Guidance which takes into account not only the type of sensitive receptor to be considered but also the existing noise levels prior to the addition of a project's contribution. The main basis of the noise impact criteria is a comparison between the existing ambient noise levels and the future noise levels from the proposed project. If the project noise contribution is well below the existing noise levels at sensitive receptors, the project is considered to have no impact.

Figure 4.6-1 presents the FTA's noise operational impact criteria. In this figure three types of sensitive receptors are considered:

- Category 1: Where quiet is essential (including national historic landmarks with significant outdoor use, recording studios, concert halls);
- Category 2: Residences and buildings where people normally sleep (including hotels); and
- Category 3: Institutional land uses with primarily daytime and evening use (includes schools, libraries, theaters and museums.

The City of San Francisco addresses noise within its municipal code but only in relation to stationary source noise. Generally, cities defer to the state's effort to address vehicle noise through vehicle code sections 23130 and 23130.5 which provide on-road vehicle noise limits enforced by police departments, sheriffs and the California Highway Patrol. Transit noise is not regulated locally.

FIGURE 4.6-1 NOISE IMPACT CRITERIA FOR TRANSIT PROJECT



SOURCE: Federal Transit Administration, May 2006.

Analysis Thresholds – Construction Noise

Impact Intensity	Impact Description
Negligible:	Construction Noise would be below ambient noise levels.
Minor:	Construction Noise would exceed ambient noise levels but would not exceed 90 dBA during daytime hours or 80 dbA during nighttime hours at residential uses, or 100 dBA at commercial or industrial land uses at any time
Moderate:	Construction noise would approach 90 dBA during daytime hours or 80 dbA during nighttime hours at residential uses, or 100 dBA at commercial or industrial land uses at any time.
Major:	Construction noise would exceed 90 dBA during daytime hours or 80 dbA during nighttime hours at residential uses, or 100 dBA at commercial or industrial land uses at any time.

Analysis Thresholds – Operational Noise

Impact Intensity	Impact Description
Negligible:	Project Noise increase in un-shaded areas in Figure 4.6-1
Minor:	Project Noise increase in un-shaded areas in Figure 4.6-1
Moderate:	Project Noise increase in lightly shaded areas in Figure 4.6-1
Major:	Project Noise increase in dark shaded areas in Figure 4.6-1

Type	
Beneficial	Beneficial impacts would be associated with reduced noise levels that would occur as the result of decreased roadway volumes from streetcar transit users that would have otherwise driven to Fort Mason.
Adverse	Adverse project impacts would be associated with increased noise and vibration to sensitive land uses along new streetcar routes from operation of streetcars.

Vibration Analysis Threshold. The City of San Francisco does not address vibration within its municipal code.

Vibration criteria in the FTA Guidance Manual are commonly used in assessing potential vibration impacts from new transit projects, and provide guidance on acceptable levels. These criteria, summarized in **Table 4.6-2**, are based on the vertical vibration velocity level of the building floor, in decibels. To avoid confusion with noise levels in decibels, the vibration velocity level is usually referred to as VdB. Vibration levels of as low as 65 VdB can be perceptible to people.

"Frequent Events" are defined as more than 70 vibration events of the same source per day, for example, more than 70 train or streetcar pass by events per day. “Occasional Events” are defined as between 30 and 70 events per day, and "Infrequent Events" are defined as less than 30 events per day. Thus, the vibration criteria for residential buildings applicable to most rapid transit or light rail systems are either 72 VdB or 75 VdB, depending on the frequency of daily operations.

TABLE 4.6-2: GROUNDBORNE VIBRATION IMPACT CRITERIA

Land Use Category	Groundborne Vibration Impact Levels in VdB		
	Frequent Events	Occasional Events	Infrequent Events
Category 1	65	65	65
Category 2	72	75	80
Category 3	75	78	83
SOURCE: U.S. Department of Transportation, Federal Transit Administration, Traffic Noise and Vibration Impact Assessment, May 2006.			

Impact Intensity	Impact Description
Negligible:	Project contribution does not alter existing vibration levels.
Minor:	Project increases vibration levels, but levels are below those indicated for each land use type and frequency combination in Table 4.6-2
Moderate:	Project increases vibration levels, but levels are at those indicated for each land use type and frequency in Table 4.6-2
Major:	Project increases vibration levels and levels exceed those indicated for each land use type and frequency in Table 4.6-2 indicated for each land use type in Table 4.6-2

4.6.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Alternative 1 would not require the construction of any new roadway, transit or utility improvements. No new construction-related noise or vibration sources or impacts would occur under Alternative 1.

New transit service would not be introduced under this alternative. Consequently, Alternative 1 would not have any new operational noise or vibration impacts related to streetcar operations or benefits from vehicle trip reduction.

Because the roadway network, parking supply and transit service would not be altered under Alternative 1, there would be no traffic volume changes or other changes to the distribution of mobile noise sources within Fort Mason and the surrounding area under this Alternative. Therefore there would be no traffic-related noise impacts.

Cumulative Impacts. There would be no incremental noise impacts under Alternative 1. Therefore this Alternative would not contribute to any potential cumulative noise or vibration impacts that may result from other development in Fort Mason and surrounding area.

Conclusions. Alternative 1 would not propose the construction of any new roadway, transit or utility improvements and would therefore not result in any new short- or long-term noise or vibration impacts, either beneficial or adverse.

4.6.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

In-Street and Transition Segment Construction Noise Impact Analysis. Alternative 2 would require the use of various pieces of construction equipment (presented in Table 4.6-1) that would be in operations during different phases of construction. FTA Guidance regarding a quantitative assessment of noise impacts from construction activities state that the following assumptions are adequate for a general assessment of each phase of construction:

- Full power operation for a time period of one hour;
- Free-field conditions are assumed and ground effects are ignored;
- Emission level of 50 feet;
- All pieces of equipment are assumed to operate at the project centerline in the case of a guideway; and
- The predictions include only the two noisiest pieces of equipment expected to be used in each construction phase.

As can be seen from the values in Table 4.6-1, the two noisiest pieces of equipment would be a concrete saw and a mounted impact hammer, each of which operate with a maximum noise level of 90 dBA at 50 feet. Resultant noise levels for simultaneous operation of these pieces of equipment are presented in **Table 4.6-3** for nearby sensitive receptors along the project alignment. Supporting calculation sheets for these predicted noise levels are presented in Appendix F.

TABLE 4.6-3: PREDICTED COMPOSITE CONSTRUCTION NOISE LEVELS AT NEARBY RECEPTORS

Receptor	Hotels and Commercial uses abutting Beach Street	2765 Hyde Street Upstairs Residences	Maritime Museum	Fontana Towers Residential	Fort Mason Landmark Building A (North Loop/ South Loop	Laguna Street Condominiums (North Loop/South Loop)
Distance from rail centerline	50 feet assumed per FTA Guidance	50 feet assumed per FTA Guidance	50 feet assumed per FTA Guidance	250 feet	80 feet/ 250 feet	400 feet/ 100 feet
Predicted composite noise level (dB, Leq)	93.0	93.0	93.0	79.0	88.9	74.9/87.0
Applicable FTA Construction Noise Criterion (daytime) dB, Leq	100	90	100	90	100	90
Exceeds Assessment Criteria?	No	Yes	No	No	No	No

As can be seen from the data presented in Table 4.6-3, construction activities would exceed FTA daytime impact criteria at the Hyde Street residential receptor nearest the project alignment. All other receptors in the In-Street and Transition Segments would be below these FTA criteria.

If construction work were to occur during nighttime hours, noise levels would also exceed FTA nighttime criteria at the Hyde Street residential receptor. Consequently, the predicted composite construction noise levels of 93 dBA at the nearest sensitive receptor would exceed the FTA daytime residential exposure criterion of 90 dBA and could be considered a major adverse impact at the residences and hotels within 50 feet. At distance beyond 75 feet, the annoyance construction vibration impact would be reduced to a minor to moderate adverse impact.

In addition to FTA construction noise criteria, the City of San Francisco noise ordinance prohibits the operation of any powered construction equipment emitting noise at a level in excess of 80 dBA at 100 feet, or an equivalent sound level at some other distance. This limit does not apply to impact tools and equipment, such as pile drivers, pavement breakers, and jackhammers, provided such equipment is fitted with approved noise control features.

Construction equipment noise levels in Table 4.6-1 are presented for a distance of 50 feet. At the 100-foot distance designated in the City's noise ordinance, the noise levels in Table 4.6-1 would be 6 dBA less. Therefore, any non-impact construction equipment in the table that exceeds 86 dBA would have the potential to exceed the standards of the City noise ordinance. The only non-impact piece of construction equipment with the potential to exceed the City of San Francisco noise ordinance standards would be the concrete saw.

In-Street and Transition Segment Vibration Impact Analysis. Groundborne vibration from activities that involve "impact tools," especially pile driving, could produce significant vibration. However, pile driving would not be a building technique used during construction of the proposed project. Other construction equipment that can have measureable vibration impacts at close distances would include auger drill rigs, jackhammers and loaded haul trucks (assuming surface irregularities in construction roads). Of these sources, the most significant vibration source would be auger drill rig operations that can result in peak particle velocities (PPV) of up to 0.089 inches per second at a distance of 25 feet, which would be below the criteria published by the U.S. Department of Transportation, which uses a standard of 0.12 inches per second for the protection of fragile buildings (defined as "buildings extremely susceptible to vibration damage").

The closest structures to the project alignment in the straightaway and transition segments would be the Maritime Museum and the west speaker tower, and western Convenience Station (roundhouse) which would be as close as 15 feet from the tracks at some locations. The Maritime Museum is a historic building with frescoes and would be considered extremely susceptible to vibration damage. Commercial uses and one residential land use along either side of Beach Street are approximately 25 feet from the alignment centerline.

Assuming auger drill operations as close as 25 feet to structures on Beach Street, auger drill vibration would be 0.089 PPV at the nearest commercial and residential structures.[4] Therefore, construction-related vibration levels would be considered a minor adverse impact at these receptors, even if the closest buildings were considered to be "fragile." For structures closer than 25 feet, specifically the Maritime Museum and its west speaker tower, construction-related vibration would have the potential to exceed DOT construction vibration damage criterion for buildings considered extremely sensitive to vibration damage. Vibrations from auger drill operations at distance of 15 and 20 feet would be 0.191 and 0.124 PPV, respectively, which would exceed the vibration criterion of 0.12 for fragile buildings. Consequently, construction-related vibration levels would be considered a major adverse impact for the Maritime Museum and its west speaker tower.

Vibration levels can also result in interference or annoyance impacts to residences or other land uses where people sleep, such as hotels and hospitals. Vibration impact criteria published by the U.S. Department of Transportation relative to these land uses are established in terms of VdB. For frequent events, a criterion of 72 VdB has been established, while for infrequent events a criterion of 80 VdB has been established. As frequent events are defined as more than 70 vibration events per day, intermittent construction-related vibration from augering would be considered as an infrequent event and, therefore, the 80 VdB criterion would apply to residences and a criterion of 83 VdB would apply to institutional uses, such as the Maritime Museum.

Auger drill operations can result in typical vibrations of 87 VdB at a distance of 25 feet. The nearest residences and hotels to the proposed project construction alignment would be residential dwellings on Hyde Street and hotels along Beach Street, located as close as 25 feet from the project alignment. Additionally, the Maritime Museum, which would be as close as 15 feet from construction activities would be exposed to vibration levels of 94 VdB which would exceed the 83 VdB criterion for institutional uses. Consequently, the predicted auger drill vibration of 87 VdB at the nearest sensitive receptors would exceed the infrequent event criterion of 80 VdB and could be considered a major adverse annoyance impact at the residences, hotels and the Maritime Museum within 50 feet. At distance beyond 50 feet, the annoyance construction vibration impact would be reduced to a minor to moderate adverse impact.

Operational Noise. Noise from intermittent streetcar operations does not significantly contribute to the existing Ldn values measured at long term noise monitoring station along existing portions of the F-line which are dominated by semi-continuous traffic noise (Wilson Ihrig & Associates 2009). However, noise from wheel/rail interactions and warning bells are generally noticeable, although were not observed to be overly intrusive.

Maximum pass-by noise from existing historic streetcars on the F-line is comparable to those from vehicular pass-by events and is dependant upon speed. Maximum streetcar noise levels from a streetcar pass-by event were recorded to range from 82 to 91 dBA at 25 feet from the track centerline with cars travelling at approximately 20-25 mph. At lower speeds (as along Jones Street) these noise levels were recorded to be 66 to 70 dBa. These noise levels were monitored in the absence of wheel squeal.

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[4] United States Department of Transportations, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, p. 12-11, May 2006.

A majority of the streetcars observed during the 2009 noise monitoring study negotiated the 90 degree turns at Jones and Beach Streets with little to no wheel squeal.[5] One streetcar however was observed to generate a high, subjectivity unpleasant noise level in excess of 100 dBA at this location due to wheel squeal.

The extent of noise impacts to land uses surrounding the proposed F-line extension alignment would depend upon the type of land use impacted, the existing noise levels at that land use and the distance of that land use from the proposed alignment. FTA guidance identifies three categories of land use sensitivity, each with its own impact criteria depending on existing noise levels. Sensitive land uses along the project alignment would primarily be hotels and residences which are characterized as Land Use category 2 (residences and buildings where people normally sleep). The Fort Mason Landmark buildings would be characterized as Land Use Category 3 (Institutional land uses with primarily daytime and evening use). Commercial land uses are considered compatible with higher transit-related noise levels by FTA guidance and are not recognized as a sensitive land use for the purposes of noise impact assessment. **Table 4.6-4** presents a summary of sensitive land uses along the project alignment, the existing noise levels at these receptors and the applicable noise impact criteria for these conditions. These levels reflect site-specific application of the generalized criteria presented in Figure 4.6-1.

TABLE 4.6-4: EXISTING NOISE LEVELS AT NEARBY RECEPTORS AND CORRESPONDING IMPACT CRITERIA

Receptor	Hotels and Ghirardelli Square and 2765 Hyde Street Upstairs Residences	Maritime Museum	Fontana Towers Residential	Fort Mason Landmark Buildings A-F	Laguna Street Condominiums (North Loop/ South Loop)
Land Use Impact Category	2 - Residences/hotels	3 - Institutional	2 - Residences/ hotels	3 - Institutional	2 - Residences/ hotels
Distance from rail centerline	25 feet	15 feet	250 feet	80 feet	400 feet/ 100 feet
Existing Noise Level (dB, Ldn)	70	70	65	60	65
Predicted Project Contribution (Ldn)	72.5	73 +	52.8	65.8/50.8	45.8/63.3
No Impact Noise level (Ldn) (project contribution)	Less than 65	Less than 69	Less than 61	Less than 63	Less than 61
Moderate Impact Noise level (Ldn) (project contribution)	65 to 69	69 to 74	61 to 66	63 to 68	61 to 66
Severe Impact Noise level (Ldn) (project contribution)	Greater than 69	Greater than 74	Greater than 66	Greater than 68	Greater than 66

[5] Wilson Ihrig & Associates, Noise and Vibration Setting Report Historic Streetcar Service to Fort Mason, April 2009.

Operational noise impacts from the extended rail service would affect receptors differently, depending on whether the receptor would be predominantly exposed to a straightaway section where cars travel at cruising seed (approximately 20 to 30 miles per hour) or a curved turning segment where speeds are reduced but the potential exits for wheel squeal from older streetcars. Consequently, the impact of each of these scenarios is evaluated independently.

In-Street and Transition Segment Operational Noise Impacts (Streetcar Impacts along Straight Rail Sections). To determine the contribution of streetcar noise to nearby sensitive receptors, a detailed analysis was performed in accordance with the methodology described in the Federal Transit Authority's document *Transit Noise and Vibration Impact Assessment.* To determine the resultant project contribution it terms of the Ldn noise descriptor it is necessary to either estimate (from look-up tables) or monitor the noise generated by a single pass-by event. Pass-by events are measured in terms of the sound exposure level (SEL) noise descriptor which normalizes the sound energy of the single pass-by event into a single second. Supporting data sheets for these monitored noise levels are presented in Appendix F.

Because the streetcar fleet is not homogeneous, a sample of SEL was collected for pass-by events of 12 different streetcars along a straightaway section where streetcars achieve a cruising speed (Beach Street between Mason and Taylor Streets). The six noisiest of these twelve SEL readings were then logarithmically averaged to obtain a conservative composite SEL. This conservative approach was employed because of the potential for other streetcars not in service or still in restoration to elevate the future SEL above what would be reflected by a composite SEL of all streetcars monitored. Six cars were selected as this is the number of hourly headways scheduled for the F-line extension. Averaging is performed not only to reflect the heterogeneity of the streetcar fleet but also because federal significance criteria for the FTA is established in terms of the day-night noise level which is a 24-hour noise descriptor.

SEL readings along this straightaway ranged from 78.1 dB (car 1010) to 96.3 dB (car 1818). The composite SEL for streetcars along the straightaway section was 91.8 dB. This composite SEL was then used as input into the FTA model, separating daytime operations (7 a.m. to 10 p.m.) and nighttime operations (10 p.m. to 7am) to determine the resultant Ldn of 68.0 at 50 feet. The resultant Ldn values at 25 and 250 feet were estimated at 72.5 dB and 58.0 dB, respectively, using FTA distance correction curves for fixed guideway noise sources. Supporting calculation sheets for these predicted noise levels are presented in Appendix F. Standardized noise propagation curves for linear noise sources become inaccurate in the "near field" (distances closer than 25 feet) and prediction of noise levels within the near field cannot reliably be estimated. However, resultant Ldn values at the Maritime Museum for which the rail tracks would be as close as 15 feet from the building façade, would likely exceed 73 dBA.

Receptors affected by streetcar noise along proposed straightaway sections would be hotels along Beach Street and the residence at 2765 Hyde Street as well as the Maritime Museum all of which would be approximately 25 feet or closer from the rail centerline and the Fontana apartments which would be 250 feet from the rail centerline. Receptors at a distance of 25 feet would be exposed to a streetcar contribution of 72.5 dB, Ldn which would be defined as a major adverse impact for residential and hotel receptors indicated in Table 4.6-4. Impacts at the Maritime Museum would approach the 74.0 dB

criterion for institutional land uses and be considered a moderate adverse impact. Fontana Towers, at a distance of 250 feet, would be exposed to a streetcar contribution of 58.0 dB, Ldn which would be characterized as a minor adverse impact, as indicated in Table 4.6-4.

Operational Vibration – In-Street Segment. A survey of groundborne vibration levels from streetcar operations was conducted in 2006[6] to determine the range of vibration levels that may be expected at sensitive receptors along the proposed alignment. The maximum vibration level monitored at the corner of Jones Street and Beach Street, where streetcars negotiate a 90 degree turn, was 75 VdB. The maximum vibration level monitored along a straightaway segment of Beach Street between Mason Street and Taylor Street was 81 VdB at 25 feet. Because of the proximity of these monitored locations to proposed extension area, it is assumed that underlying geological conditions would be similar and that propagation of vibrations would not be measurably different. Resultant VdB values from streetcars during turning operations and along straightaway segments at 250 feet were estimated to be 61 VdB and 55 VdB, respectively, using FTA ground surface vibration curves for light rail vehicles.

Receptors potentially affected by streetcar vibration along proposed straightaway sections would be hotels along Beach Street and the residence at 2765 Hyde Street., all of which would be within 25 feet of the rail centerline and the Fontana apartments which would be 250 feet from the rail centerline. On straightaways, resultant VdB values from streetcars at 25 and 250 feet were estimated to be 81 VdB and 61 VdB, respectively. Predicted vibration levels at receptors at a distance of 25 feet would be characterized as a major adverse impact with regard to FTA criteria for residential and hotel land uses. Fontana Towers, at a distance of 250 feet, would be exposed to a streetcar contribution of 61 VdB which would be characterized as a minor adverse impact.

Operational Vibration – Transition Segment. The Maritime Museum, west Convenience Station and west speaker tower of the Maritime Museum are located along the Transition Segment and approximately 15 feet of the rail center. The nuisance impact on people at these institutional uses is not as much of a consideration as the potential for structural damage from operational vibration generated by streetcars. Streetcar speeds along this segment would likely be reduced compared with those monitored at the existing Beach Street straight-aways. However, as a conservative analysis, a straightaway vibration level of 81 VdB may be assumed. This vibration level at a distance of 15 feet would be further increased to 88 VdB, which corresponds to a PPV of approximately 0.107. This would be below the U.S. DOT criterion of 0.12 PPV (or 90 VdB) for buildings extremely susceptible to vibration damage. Therefore operational vibration impacts with regard to the structural integrity of the Maritime Museum and its west speaker tower is considered a minor adverse impact[7]. However, mitigation measures identified with regard to major adverse nuisance vibration impacts along the In-street segment are recommended to be extended to the Museum and speaker tower to minimize the potential for structural damage to these historic structures and reduce this minor adverse impact.

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[6] Wilson Ihrig & Associates, Noise and Vibration Setting Report Historic Streetcar Service to Fort Mason, April 2009.

[7] The FTA states: *it is extremely rare for vibration from train operations to cause any sort of building damage, even minor cosmetic damage. However, there is sometimes concern about damage to fragile historic buildings located near the right-of-way. Even in these cases, damage in unlikely except when the track will be very close to the structure.* FTA recommends use of its 0.12 in/sec (or 90 VdB) criterion for buildings extremely susceptible to vibration damage. United States Department of Transportations, Federal Transit Administration, *Transit Noise and Vibration Impact Assessment*, p. 8-4, May 2006.

Fort Mason Tunnel Segment Construction Noise. Construction noise generated within the tunnel would be substantially reduced from the construction noise levels presented in Table 4.6-3. While construction noise would emanate from the two tunnel portals, even the composite equipment noise of 93.0 dBA can reasonably be assumed to be attenuated by tunnel walls by a minimum of 5 dBA. Therefore, construction noise impacts within the Fort Mason Tunnel Segment would be considered a minor adverse impact.

Fort Mason Tunnel Segment Construction Vibration. Construction vibration within the tunnel would be substantially reduced from predicted auger drill vibration would be 0.089 PPV at 25 feet. Tunnel construction activities would not require auger drill operations. Therefore construction vibration impacts at buildings above the tunnel would be below the 80 VdB criterion for infrequent events as therefore represent a minor adverse construction vibration impact.

Fort Mason Tunnel Segment- Operational Noise. Operational noise generated within the tunnel would be substantially reduced from the operational noise levels presented in Table 4.6-4. While streetcar noise would emanate from the two tunnel portals, operational streetcar noise can reasonably be assumed to be attenuated by tunnel walls by a minimum of 5 dBA. Therefore, operational noise impacts within the Fort Mason Tunnel Segment would be considered a minor adverse impact.

Fort Mason Tunnel Segment- Operational Vibration. Vibration impacts to buildings above the tunnel within Fort Mason would experience lesser operational vibration impacts than those predicted for the straightaway segments because of the propagation distances involved. Vibrations would travel laterally out of the rail toward the sides of the tunnel approximately 10 feet before it could then travel upwards through the soil from a track elevation of approximately 40 feet to an elevation of 100 feet or more in locations where buildings are present. Vibrations at this approximated distance of 70 feet are estimated to be 74 VdB which would be considered a minor adverse impact for Category 3 land uses and would not approach the 90 VdB criterion for the protection of extremely fragile structures.

Alternative 2A: North **Loop Option - Construction Noise.** The two noisiest pieces of equipment in Table 4.6-1 would be a concrete saw and a mounted impact hammer, each of which operate with a maximum noise level of 90 dBA at 50 feet. Resultant noise levels for simultaneous operation of these pieces of equipment are presented in **Table 4.6-3** for nearby sensitive receptors along the project alignment and indicate a noise level of 88.9 dBA at the Landmark building. This noise level is below the FTA criterion of 100 dBA for institutional land uses and would be considered a minor adverse impact. Calculations used the Landmark building as a worst-case scenario for Fort Mason as other buildings would be located substantially further from construction activity not occurring within the tunnel. The nearest residential land use to the North Loop construction area would be Laguna Street condominiums located approximately 400 feet away where resultant noise levels would be 74.9 dbA. This noise level would be below the FTA criterion of 90 dBA for institutional land uses and would be considered a minor adverse impact.

Alternative 2A: North **Loop Option - Construction Vibration.** Auger drill operations would have the greatest potential to generate vibration and can result in typical vibrations of 87 VdB at a distance of 25 feet. The nearest residences to the proposed North Loop alignment would be Laguna Street condominiums located approximately 400 feet away where resultant vibration levels would be reduced

to of 51 VdB which would be well below the 80 VdB criterion for residential uses. Vibrations at the Landmark Building, approximately 80 feet away, would be 72 VdB. This predicted vibration level would be below the 83 VdB criterion for institutional land uses and would be considered a minor adverse impact.

Alternative 2A: North Loop Option Operational Noise. Streetcar impacts along curved segments were estimated using the same methodology as straightaway segments except that the baseline SEL measurements from streetcars used were collected from the corner of Beach Street and Jones Street where streetcars negotiate a 90 degree turn. Generally, streetcars are travelling slower at turning points and therefore noise levels are less than those monitored along straightaways. However, older streetcars can produce noticeable wheel squeal when negotiating turns.

Again, because the streetcar fleet is not homogeneous, a sample of SEL was collected for pass-by events of 15 different streetcars. Of these 15 different cars only one produced wheel squeal of a nature that significantly increased the monitored SEL. The highest six of these 15 SEL readings were then logarithmically averaged to obtain a conservative composite SEL. This conservative approach was employed because of the potential for other streetcars not in service or still in restoration to elevate the future SEL above what would be reflected by a composite SEL of all streetcars monitored. Six cars were selected as this is the number of hourly headways scheduled for the F-line extension. SEL readings along this curve ranged from 71.2 dB (car 1015) to 84.9 dB (car 162)with the exception of car 952, an older (1923) streetcar from New Orleans which resulted in a pass-by SEL of 98.9 dB. **Table 4.6-5** presents the SEL and Maximum noise levels recorded for each of these events. Maximum noise (Lmax) levels are presented for reader reference only as significance thresholds for transportation sources are not established in terms of the Lmax descriptor.[8]

While only a single streetcar produced subjectively adverse wheel squeal during a two hour monitoring effort, it was conservatively assumed that this phenomena would occur on an hourly basis, given that other fleet streetcars with this capability may also be in operation. The composite SEL for streetcars along a curved section of track was 91.6 dB. This composite SEL was then used as input into the FTA model, separating daytime operations (7 a.m. to 10 p.m.) and nighttime operations (10 p.m. to 7am) to determine the resultant Ldn of 67.8 dB at 50 feet.

Receptors affected by streetcar noise along proposed North Loop section would be Fort Mason Landmark Building A which would be within approximately 80 feet from the rail centerline and the Laguna Street Condominiums which would be 400 feet from the rail centerline at the western portal of the tunnel. Receptors at a distance of 80 feet would be exposed to a streetcar contribution of 65.8 dB, Ldn which would be defined as a moderate adverse impact as indicated in Table 4.6-4. This would be the maximum operational noise impact for any receptor in Fort Mason. Residential receptors on Laguna Street, at a distance of 400 feet, would be exposed to a streetcar contribution of 45.8 dB, Ldn which would be characterized as a negligible adverse impact, as indicated in Table 4.6-4.

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[8] Standards for stationary equipment are occasionally set in terms of maximum noise levels as equipment can commonly have a consistent operational characteristic. Mobile source impact criteria are not established in terms of maximum noise levels because of the intermittent character of transportation noise. Additionally, there can be large variations in existing background levels for this descriptor, particularly in urban areas. For example, a ubiquitous occurrence such as a car door slam at a distance of 20 feet can easily produce an Lmax of 90 dBA.

TABLE 4.6-5: MONITORED AND ATTENUATED STREETCAR NOISE LEVELS AT ON CURVED TRACK SECTIONS

Streetcar Number/Type[a]	Monitored SEL (dBA)at 50 feet	Monitored Lmax at 50 feet	Attenuated Lmax at 100 feet	Attenuated Lmax at 200 feet	Attenuated Lmax at 400 feet
1015/PCC	71.2	61.1	58.1	55.1	52.1
1062/PCC	80.1	71.9	68.9	65.9	62.9
952/NO	**98.9**	**94.9**	**91.9**	**88.9**	**85.9**
1077/PCC	79.1	69.9	66.9	63.9	60.9
1010/PCC	75.0	68.1	65.1	62.1	59.1
1059/PCC	75.5	68.5	65.5	62.5	59.5
1060/PCC	76.1	69.0	66.0	63.0	60.0
1075/PCC	74.1	66.6	63.6	60.6	57.6
1007/PCC	76.3	69.0	66.0	63.0	60.0
1051/PCC	74.2	66.7	63.7	60.7	57.7
1056/PCC	77.2	70.8	67.8	64.8	61.8
162/SF	84.9	76.5	73.5	70.5	67.5
1859/Milan	81.7	78.8	75.8	72.8	69.8
1818/Milan	83.2	77.6	74.6	71.6	68.6
1057/PCC	77.7	69.8	66.8	63.8	60.8
Monitored Lmax along Beach street		85			
Monitored Lmax near Fontana Towers					83
Existing monitored Lmax at Building A		91			
Existing monitored Lmax at Laguna Street Residences					83

[a] PCC =Presidents Conference Committee car. Double- or single-end coach cars built 1946-1948.; NO =New Orleans streetcar built in 1923; Milan = Milan Streetcars built from 1930s to 1970s.

Alternative 2A: North Loop Option Operational Vibration. Receptors affected by streetcar vibration along the proposed North Loop section would be Fort Mason Landmark Building A which would be within approximately 80 feet from the rail centerline and the Laguna Street Condominiums which would be 400 feet from the rail centerline at the western portal of the tunnel. Receptors at a distance of 80 feet would be exposed to streetcar vibration of 72 VdB which would be a minor adverse impact indicated in Table 4.6-2. Residential receptors on Laguna Street, at a distance of 400 feet, would be exposed to a streetcar vibration of less than 50 VdB which would be characterized as a minor adverse impact and similar to existing vibration levels monitored in the area.

Alternative 2B: South Loop Option Construction Noise. Construction noise impacts of the South Loop option would differ from those described in the North Loop option only for receptors near the west Tunnel portal. Fort Mason Landmark Building A would be approximately 250 feet from the rail centerline at the tunnel portal, as opposed to the 80 foot distance from the North Loop. However, the

Laguna Street Condominiums would be approximately 100 feet from the rail centerline at the southernmost arc of the Southern Loop, as opposed to the 400 foot distance from the tunnel portal in the North Loop scenario.

Construction noise at Building A would be 79.0 dBA with simultaneous operation of the two noisiest pieces of equipment. This would be less than the 100 dBA criterion of the FTA for non-residential land uses and be considered a minor adverse impact.

Construction noise at Laguna Street condominiums would be 87.0 dBA with simultaneous operation of the two noisiest pieces of equipment. This would be less than the 90 dBA criterion of the FTA for residential land uses and be considered a minor adverse impact.

Alternative 2B: South Loop Option Construction Vibration. The most significant construction-related vibration source would be auger drill rig operations that can result in PPV of up to 0.089 inches per second at a distance of 25 feet, which would be below the criteria published by the U.S. Department of Transportation, which uses a standard of 0.12 inches per second for the protection of fragile buildings. The closest structures to the South Loop area would be residential condominiums approximately 100 feet away. At which distance vibration would be reduced to 0.011 inches per second, which would be below the criteria published by the FTA, which uses a standard of 0.12 inches per second for the protection of fragile buildings. Therefore, construction-related vibration levels would be considered a minor adverse impact, even if the closest buildings were considered to be "fragile."

Vibration levels can also result in interference or annoyance impacts to residences or other land uses where people sleep and, for infrequent events, a criterion of 80 VdB has been established.

Auger drill operations can result in typical vibrations of 87 VdB at a distance of 25 feet. The nearest residence or hotel to the South Loop would be condominium residential dwellings on Laguna Street 100 feet from the project South Loop at which distance vibrations would be reduced to 69 VdB. This predicted auger drill vibration at the nearest sensitive receptor would not exceed the infrequent event criterion of 80 VdB and could be considered a minor adverse annoyance impact at the residences on Laguna Street.

Alternative 2B: South Loop Option Operational Noise. Operational noise impacts of the South Loop option would differ from those described in the North Loop option only for receptors near the west Tunnel portal. Fort Mason Landmark Building A would be further away from streetcar operations at approximately 250 feet from the rail centerline, while the Laguna Street Condominiums would be approximately 100 feet from the rail centerline at the southernmost arc of the Southern Loop, as opposed to the 400 foot distance from the tunnel portal in the North Loop scenario.

Receptors at a distance of 100 feet would be exposed to a streetcar contribution of 63.3 dB, Ldn which would be considered a moderate adverse impact as indicated in Table 4.6-4. Non-residential receptors in Landmark Building A, at a distance of 250 feet, would be exposed to a streetcar contribution of 50.8 dB, Ldn which would be characterized as a negligible adverse impact.

The above analysis is based on monitoring of existing turning radius for the comparatively wide turns from Jones Street onto Beach Street. The turning radius proposed for the South Loop would be sharper

and potentially more susceptible to wheel squeal impacts. To investigate this possibility, additional noise monitoring was conducted at the sharpest turn of the existing F-line at the corner of 17th Street and Market Street. Because of the sharpness of this turn (approximately a 45-foot turning radius), streetcars negotiate this curve at a very low speed. During a two hour survey of streetcar operations at this curve no pronounced wheel squeal was observed during noise monitoring. This may be the result of the slower speeds streetcars operate on this curve or a result of older, noisier cars not being is service that day. Additionally, floating slab construction has been implemented on sections of 17th Street between Sanchez and Market Streets because of the proximity and density of residential receptors adjacent to the tracks in the area (Katz 2010) and may have resulted in decreased rail/wheel interactions. Regardless, as a conservative analysis, the potential for the increase in occurrence of wheel squeal at the South Loop was accounted for by assuming that squeal events similar to those monitored at Jones and Beach Streets would occur every hour, twice as frequently as those which were currently observed to exist.

Alternative 2B: South Loop Option Operational Vibration. Operational vibration impacts of the South Loop option would differ from the North Loop option only for Fort Mason Landmark Building A and Laguna Street residences. Fort Mason Landmark Building A would be approximately 250 feet from the rail centerline, while the Laguna Street Condominiums would be approximately 100 feet from the rail centerline at the southernmost arc of the Southern Loop.

Receptors at a distance of 250 feet would be exposed to streetcar vibration of 57 VdB which would be a minor adverse impact and similar to existing vibration levels monitored in the area. Residential receptors on Laguna Street, at a distance of 100 feet, would be exposed to a streetcar vibration of less than 65 VdB which would be characterized as a minor adverse impact.

Cumulative Impacts. Cumulative effects to noise and vibration should consider the past present and reasonable foreseeable actions in the study area in addition to potential affects of Alternative 2. The projects identified include only those projects that could affect transit operations and thus noise and vibration within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on noise and vibration include the Presidio Transit Program, the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fisherman's Wharf Public Realm Plan, Van Ness Bus Rapid Transit, E-Embarcadero Historic Streetcar Line, and SFMTA's Transit Effectiveness Project. The beneficial impacts would result from increased use of transit (with a corresponding decrease use of private automobiles). The degree of travel mode shift away from private automobiles is not certain. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to noise and vibration conditions within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, SF Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive could result in short-term adverse impacts on noise and vibration. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction equipment. The intensity of the adverse effects from the construction-related noise and vibration

would range from minor to moderate, depending on which, if any, of the construction projects occurred simultaneously. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to noise and vibration.

Mitigation Measures

NOISE-1: Construction Noise Mitigation. Proximity to construction operations would impact the residential units on the corner of Hyde and Beach Streets. Because units are within 25 feet of the rail centerline, construction noise levels would exceed FTA suggested thresholds at this one location by 3 dBA and result in a major adverse impact. To reduce the severity of this construction noise impact the following measures are recommended to be incorporated into the construction contract agreement documents to be implemented by the construction contractor:

- Provide enclosures and mufflers for stationary equipment, shroud or shield impact tools, and install barriers around particularly noisy activities at the construction sites so that the line of sight between the construction activities and nearby sensitive receptor locations is blocked;
- Use construction equipment with lower noise emission ratings whenever possible, particularly for air compressors;
- Provide sound-control devices on equipment no less effective than those provided by the manufacturer;
- Locate stationary equipment, material stockpiles, and vehicle staging areas as far as practicable from sensitive receptor locations;
- Prohibit unnecessary idling of internal combustion engines;
- Require applicable construction-related vehicles and equipment to use designated truck routes to access the project sites; and
- Implement noise attenuation measures to the extent feasible, which may include, but are not limited to, noise barriers or noise blankets. The placement of such attenuation measures shall be reviewed and approved by the Director of Public Works prior to issuance of development permits for construction activities.

VIBR-1: Construction Vibration Mitigation. Proximity to construction operations would result in a major adverse annoyance vibration impacts the residential units on the corner of Hyde and Beach Streets as well as hotels along Beach Street. Auger drilling operations would exceed the FTA annoyance criterion for infrequent events by 7 VdB at receptors within 25 feet. This annoyance criterion is established for "residential land uses and any buildings where people sleep, such as hotels and hospitals". As such, it reflects the increased sensitivity of persons to vibration while they sleep. Therefore, the following measure is recommended to be incorporated into the construction contract agreement documents to be implemented by the construction contractor:

- Conduct auger drilling activities during daytime hours to reduce potential construction-related annoyance vibration impacts to residents and hotel guests sleeping within 50 feet of drilling locations.

- Require vibration monitoring as a specification in construction contract. Construction vibration monitoring should be conducted when construction activities approach within 50 feet of the Maritime Museum, west Convenience Station or the west speaker tower. If

monitored values reach 0.10 in/sec, the vibration–causing activity should be halted and an alternative, low impact method implemented until the construction phase is beyond 50 feet of the Maritime Museum or tower.

NOISE-2: Operational Noise Mitigation. Proximity to streetcar operations (within 25 feet) would result in a major adverse impact at the residential units on the corner of Hyde and Beach Streets and at Ghirardelli Square as well as hotels along Beach Street. Standards would be exceeded by 3.5 dBA. To reduce the severity of this operational noise impact, the following measures are recommended:

- Retrofit cars with resilient or damped wheels – Resilient and damped wheels reduce rolling noise by approximately 2 dBA; or
- Application of shielding and/or absorptive material under the car. Acoustical absorption under the car has been demonstrated to provide up to five decibels of mitigation for wheel/rail noise.

VIBR-2: Operational Vibration Mitigation. Proximity to streetcar operations (within 25 feet) would result in a major adverse impact to the residential units on the corner of Hyde and Beach Streets and at Ghirardelli Square as well as hotels along Beach Street. Annoyance (not structural) standards would be exceeded by 9 VdB. Additionally, there is a potential for a minor adverse structural impact to occur at the Maritime Museum due to proximity of the rail lines to the building and the west speaker tower the fragile nature of the structures and interior murals and the unconsolidated soils of the area.

Because streetcar operations would occur between the "nighttime" hours of 6 a.m. to 7 a.m. and 10 p.m. to 12am, annoyance impacts could not be reduced by restricting operations to daytime hours. Additionally, because historic streetcars are proposed, improvements to vehicle specifications are limited. Specialized track support systems (e.g., floating slabs and resilient fasteners) of at-grade track exist as a viable mitigation measures if economically feasible. Therefore the following measure is identified as potentially feasible mitigation based on FTA guidance:

- Reduce vehicle speed down Beach Street during nighttime hours. Reducing vehicle speeds by a factor of two would reduce vibration levels by approximately 6 VdB.

Implementation of the above measure would not reduce the severity of the predicted major adverse impact from operational vibration. Implementation of resilient fasteners are documented to reduce vibration by 5 to 10 VdB at frequencies above 40 Hertz and could potentially reduce vibration impacts to from major to moderate. Alternatively, floating slab construction which has been used to address vibration impacts in other areas of the F-line could be implemented to further reduce potential vibration impacts to a moderate level. Floating slab technology is also recommended for areas within 50 feet of the Maritime Museum, west Convenience Station and the west speaker tower to mitigate potential structural impacts to these historic structures.

Conclusions. Alternative 2 would result in major adverse impacts to the residential units on the corner of Hyde and Beach Streets and at Ghirardelli Square as well as hotels along Beach Street and the Maritime Museum. Impacts would result from construction noise, construction-related vibration, operational noise and operational vibrations. Identified mitigation would reduce these major adverse impacts to the moderate level.

4.7 CULTURAL RESOURCES

4.7.1 Methodology and Assumptions

Cultural resources are protected through the National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470 et seq.), and its implementing regulations, Protection of Historic Properties (36 CFR Part 800). Prior to implementing an "undertaking" (e.g., issuing a federal permit), Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation (ACHP) and the State Historic Preservation Officer (SHPO) a reasonable opportunity to comment on any undertaking that would potentially affect properties listed or eligible for listing in the National Register. Section 110 (f) of the NHPA provides additional considerations for any undertakings that may have an adverse impact on National Historic Landmarks (NHLs).

Section 106 Regulations (36 CFR Part 800.8) state that preparation of an EIS and ROD under NEPA should include appropriate scoping, identification of historic properties, assessment of effects upon them, and consultation leading to resolution of any adverse effects. To that end, this section will assess the effects (or impacts) of the project (or undertaking) on these historic properties.

Compliance with the NHPA has been conducted by the National Park Service as a separate effort that has been coordinated with NEPA compliance. Documentation relating to the Section 106 process for NHPA compliance can be found in Appendix A of this document. Compliance with Section 110(f) will be addressed in a separate submittal to the ACHP.

Assessing Impacts Thresholds. Assessing impacts on historic properties under Section 106 of the NHPA is regulated at 36 CFR Part 800.5. An adverse effect to a historic property "is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the Nation Register" (36 CFR Part 800.5(1)). Characteristics that qualify a property for inclusion include the seven integrity factors listed in Section 3.7.4 (location, design, setting, materials, workmanship, feeling, and association). Adverse impacts can include "reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative." A determination of effects analysis for NEPA should include: direct and indirect effects; duration of the effect (short-term, long-term); context of the effect (site-specific, local, regional); intensity of the effect (negligible, minor, moderate, major, both adverse and beneficial); and the cumulative nature of the effect.

Historic Architectural Resources Analysis Thresholds. Historic architectural resources are typically determined eligible for listing in the National Register under criteria A through C, listed above, for their association with historical events, important people, or for their exhibition of distinctive characteristics of type, period, and method of construction. Eligible resources must also retain sufficient integrity to convey their historical significance. Provided below are the thresholds for determining the intensity of impacts to historic architectural resources.

Impact Intensity	Impact Description
Negligible:	The undertaking would cause no alteration to a district, building, structure, object, or site that is listed or eligible for listing on the National Register of Historic Places (or alterations would be so minor as to be imperceptible). For the purposes of the National Historic Preservation Act Section 106, the determination of effect would be "no adverse effect."
Minor Adverse:	The undertaking would result in a modification to an eligible or listed district, building, structure, object, or site, but would not modify or alter any of the characteristics that qualify the property for National Register inclusion. The Section 106 determination of effect would be "no adverse effect."
Moderate Adverse:	The undertaking would alter, directly or indirectly, one or more character-defining features of a district, building, structure, object, or site that is listed or eligible for listing on the National Register, in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association. However, this impact would not diminish the integrity of the resource such that its eligibility for the National Register would be jeopardized. The Section 106 determination of effect would be "adverse effect."
Major Adverse:	The undertaking would have a substantial, noticeable, and permanent impact to a district, building, structure, object, or site listed or eligible for listing in the National Register. The undertaking would result in the alteration or modification of one or more characteristics that qualify the resource's inclusion in the National Register, diminishing the integrity of the property's location, design, setting, materials, workmanship, feeling or association to such an extent that it is no longer eligible for listing in the National Register. The Section 106 determination of effect would be "adverse effect."

Archeological Resources Impacts Thresholds. Archeological resources (districts and sites) can be determined eligible for listing in the National Register under any of the four criteria listed above, but are most often found eligible under Criterion D for their potential to yield information important to prehistory or history. Resources must retain sufficient integrity to contribute to our understanding of current research questions, which means they must be relatively intact and undisturbed. Provided below are the thresholds for determining the intensity of impacts to archeological resources.

Impact Intensity	Impact Description
Negligible:	The undertaking would not modify or alter archeological districts or sites listed or eligible for listing in the National Register. The Section 106 determination of effect would be "no adverse effect."
Minor Adverse:	The undertaking would result in a slight modification or alteration of an archeological district or site eligible for listing or listed in the National Register, but would not affect any of the characteristics that qualify the resource for National Register inclusion. The integrity of the resource would not be compromised. The Section 106 determination of effect would be "no adverse effect."
Moderate Adverse:	The undertaking would result in the modification or alteration of one or more of the characteristics that qualify the archeological district or site for inclusion in the National Register. The resource's integrity would be diminished, but not to the extent that the National Register eligibility of the resource would be jeopardized. The Section 106 determination of effect would be "adverse effect."
Major Adverse:	The undertaking would have a substantial, noticeable, and permanent impact to a district or site listed or eligible for listing in the National Register. The undertaking would result in the alteration or modification of one or more characteristics that qualify the resource for inclusion in the National Register, diminishing the integrity of the resource to such an extent that it is no longer eligible for listing in the National Register. The Section 106 determination of effect would be "adverse effect."

Cultural Landscape Impacts Thresholds. A cultural landscape is "a geographic area, including both cultural and natural resources, that is associated with a historic event, activity, person, or exhibiting other cultural or aesthetic values" (NPS 1998). Cultural landscapes can be related to use of the landscape by peoples in either pre-contact or historic times. The assessment of impacts on cultural landscapes can include archeological resources, ethnographic resources, and historic or prehistoric structures. Historic viewsheds are analyzed in Section 4.9 Visual and Aesthetic Resources. Provided below are the thresholds for determining the intensity of impacts to cultural landscapes.

Impact Intensity	Impact Description
Negligible:	The undertaking would not alter (or alterations would be unperceivable) cultural landscapes listed or eligible for listing in the National Register. The Section 106 determination of effect would be "no adverse effect."
Minor Adverse:	The undertaking would slightly alter the cultural landscape, but would not affect any of the characteristics that qualify the landscape for inclusion in the National Register. The Section 106 determination of effect would be "no adverse effect."
Moderate Adverse:	The undertaking would result in the alteration or modification of one or more of the characteristics that qualify the cultural landscape for inclusion in the National Register. The cultural landscape's integrity would be diminished, but not to the extent that the National Register eligibility of the cultural landscape would be jeopardized. The Section 106 determination of effect would be "adverse effect."
Major Adverse:	The undertaking would have a substantial, noticeable, and permanent impact to a cultural landscape listed or eligible for listing in the National Register. The undertaking would result in the alteration or modification of one or more characteristics that qualify the cultural landscape for inclusion in the National Register, diminishing the integrity of the cultural landscape to such an extent that it is no longer eligible for listing in the National Register. The Section 106 determination of effect would be "adverse effect."

4.7.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Alternative 1 would not require the construction of any new roadway, transit or utility improvements. As a result, no new construction-related impacts to cultural resources would occur under Alternative 1.

New transit service would not be introduced under this alternative. Consequently, Alternative 1 would not have any new operational impacts to cultural resources such a noise or vibration.

Because the roadway network, parking supply and transit service would not be altered under Alternative 1, there would be no change in the use or character of either the San Francisco Maritime National Historic Park or Fort Mason, which are National Historic Landmarks and are listed in the National Register.

Cumulative Impacts. There would be no incremental impacts to cultural resource under Alternative 1. Therefore this Alternative would not contribute to any potential cumulative impacts to cultural resources that may result from other development in Fort Mason and surrounding area.

Conclusions. Alternative 1 would not propose the construction of any new roadway, transit or utility improvements and would therefore not result in any new short- or long-term impacts, either beneficial or adverse, to cultural resources.

4.7.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Alternative 2A: North Loop Option. The potential construction and operational impacts of the North Loop option of the proposed streetcar line extension have been incorporated into a table (**Table 4.7-1**) arranged according to the four project segments (in-street, transition, tunnel, and turnaround), going from east to west. This Table was designed to describe impacts that are for the most part minor or negligible. The cultural resources are described individually, and include only those buildings, structures, objects, sites, or cultural landscape features that are recognized as primary or contributing resources to National Register-listed or eligible properties. The analysis of overall impacts to the Aquatic Park NHL District and the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District are discussed separately in text after Table 4.7-2. Additional analysis of impacts to archeological resources follows this discussion.

Where a moderate or major adverse effect has been identified, mitigation measures are provided to avoid, reduce, or mitigate that effect. No mitigation measures are recommended for impacts that are negligible or minor, with the exception of impacts to archeological resources.

Alternative 2B: South Loop Option. The Construction and operational impacts of the South Loop Option would be identical to the in-street, transition, and tunnel impacts of Alternative 2A: North Loop Option described in **Table 4.7-1**, above. However, the South Loop Option would differ in terms of impacts within the tunnel and turnaround segments. These impacts are described below in **Table 4.7-2.** Like Table 4.7-1, the following (Table 4.7-2) was designed to describe impacts that are for the most part minor or negligible. The table includes individual NRHP-listed, eligible, or contributing buildings, structures, objects, or sites or contributing features to a cultural landscape. The analysis of overall impacts to the Aquatic Park NHL District and the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District are discussed separately in text after Table 4.7-2. Potential impacts to archeological resources that could result from the extension of historic streetcar service along the South Loop alignment are also described below in further detail.

Impacts to Aquatic Park National Historic Landmark District

Impacts to the NHL District as a Whole: The introduction of streetcar tracks, an overhead contact system, lights, signals, and passenger platforms would add new, non-contributing and incompatible elements to the western end of Aquatic Park, and therefore result in an adverse impact to the historic setting, feeling, and association of the NHL District as a whole. The addition of streetcar-associated noise, vibration, and new uses that would be incompatible with the historic feeling and association of the District would also contribute to the adverse impact. The demolition of a contributing stone retaining wall and removal of historic State Belt Line railroad tracks as they cross Van Ness Avenue would be a direct adverse impact on the historic design, materials and workmanship of the District. The overall impact of these changes is deemed as a moderate adverse impact to the Aquatic Park NHL District because it would result in the alteration or modification of one or more of the characteristics

TABLE 4.7-1: SUMMARY OF CULTURAL IMPACTS BY PROJECT SEGMENT – ALTERNATIVE 2A: NORTH LOOP OPTION

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
In-Street Segment				
California Fruit Canners Association (Haslett) Warehouse	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
San Francisco Cable Cars NHL	• Track crossing	Negligible	Long	N/A
Aquatic Park East Convenience Station (Roundhouse)	• Visual: overhead contact system	Negligible	Long	N/A
Aquatic Park Sea Wall	• Visual: overhead contact system	Negligible	Long	N/A
Aquatic Park East Speaker Tower	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Aquatic Park East Bleachers	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Aquatic Park Bathhouse	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse*	Long	N/A
Pioneer Woolen Mills & D. Ghirardelli Company	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Potential archeological Site CA-SFr-23 at Hyde/Beach Street Intersection	• Ground-disturbing construction for new tracks	Negligible	Short	Worker education, construction monitoring, and inadvertent discovery mitigation
Transition Segment				
Aquatic Park West Bleachers	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Aquatic Park Stone Retaining Wall	• Removal of wall segment for track ROW	Major adverse	Long	• HABS/HALS documentation • Retain/reuse wall materials for new construction • Interpretation of wall history or contribution to cultural landscape

TABLE 4.7-1: SUMMARY OF CULTURAL IMPACTS BY PROJECT SEGMENT – ALTERNATIVE 2A: NORTH LOOP OPTION (CONTINUED)

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
Transition Segment (cont.)				
Historic rail tracks within the western end of Aquatic Park and near the terminus of Van Ness Avenue.	• Removal of historic rail segment and replacement with new tracks	Moderate adverse	Long	• Same as above for stone retaining wall
Aquatic Park West Speaker Tower	• Noise/vibration: streetcar operation • Visual: overhead contact system • Visual: passenger loading platform	Moderate adverse*	Long	N/A
Aquatic Park Promenade Retaining Wall	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Aquatic Park West Convenience Station (Roundhouse)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Aquatic Park Sea Scout Building & Dock	• Visual: overhead contact system	Negligible	Long	N/A
Pumping Station No. 2, S.F.F.D. Auxiliary Water Supply	• Visual: overhead contact system	Negligible	Long	N/A
Municipal Pier	• Visual: overhead contact system	Negligible	Long	N/A
State Belt Railroad Tracks	• Removal of tracks near entrance to Fort Mason Tunnel	Moderate adverse	Long	N/A
Aquatic Park Cultural Landscape Features: Van Ness Avenue Sidewalks	• Reconstruction of portion of sidewalk	Negligible	Long	N/A
Fort Mason Tunnel Segment				
Fort Mason Tunnel	• Removal of historic tracks; replacement with new tracks • Installation of a new tunnel lining/stabilization materials • Installation of overhead wires and signals	Moderate adverse	Long	• HABS/HALS documentation of tunnel portals • Interpretation of tunnel's historic use • Stabilize walls with compatible materials • Ensure new elements are compatible with historic design

TABLE 4.7-1: SUMMARY OF CULTURAL IMPACTS BY PROJECT SEGMENT – ALTERNATIVE 2A: NORTH LOOP OPTION (CONTINUED)

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
Fort Mason Tunnel Segment (cont.)				
North Retaining Wall	• Demolition of north retaining wall near West Portal	Major adverse	Long	• HABS/HALS documentation of retaining walls at west portal
Fort Mason Turnaround Segment – North Loop				
San Francisco Port of Embarkation Building A (FM-308)	• Noise/vibration: streetcar operation • Visual: overhead contact system • Visual: passenger loading platform	Minor adverse	Long	N/A
San Francisco Port of Embarkation Building B (FM-310)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
San Francisco Port of Embarkation Building C (FM-312)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
San Francisco Port of Embarkation Building D (FM-314)	• Visual: overhead contact system	Negligible	Long	N/A
San Francisco Port of Embarkation Building E (FM-315)	• Visual: overhead contact system	Negligible	Long	N/A
San Francisco Port of Embarkation Entrance Wall and Gate (FM-301)	• Noise/vibration: streetcar operation • Visual: overhead contact system • Visual: passenger loading platform	Minor adverse	Long	N/A
San Francisco Port of Embarkation Gatehouse (FM-302)	• Noise/vibration: streetcar operation • Visual: overhead contact system • Visual: passenger loading platform	Minor adverse	Long	N/A
San Francisco Port of Embarkation Guard Station (FM-303)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A

TABLE 4.7-1: SUMMARY OF CULTURAL IMPACTS BY PROJECT SEGMENT – ALTERNATIVE 2A: NORTH LOOP OPTION (CONTINUED)

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
Fort Mason Turnaround Segment – North Loop (cont.)				
San Francisco Port of Embarkation Railroad Tracks (FM-406)	• Removal of track sections along ROW	Moderate adverse	Long	• Include tracks in HABS/HALS documentation • Retain existing rails wherever possible • Interpretation of historic rail service at the Port of Embarkation
* Operational vibration would constitute a major nuisance impact for the institutional uses at the Bathhouse; structural vibration impacts would be minor at both the Bathhouse and the West Speaker Tower. See Section 4.6 Noise and Vibration for additional discussion of the applicable impact thresholds and assessments for historic buildings and structures.				

TABLE 4.7-2: SUMMARY OF CULTURAL IMPACTS – ALTERNATIVE 2B: SOUTH LOOP OPTION

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
Fort Mason Tunnel Segment – South Loop				
Fort Mason Tunnel	• Removal of historic tracks; replacement with new tracks • Installation of a new tunnel lining/stabilization materials • Installation of overhead wires and signals • Demolition of south retaining wall near West Portal	Moderate adverse	Long	• HAER/HALS documentation of tunnel portals and retaining walls at west portal • Interpretation of tunnel's historic use • Stabilize walls with salvaged and/or compatible materials • Ensure new elements are compatible with historic design
Fort Mason Turnaround Segment – South Loop				
San Francisco Port of Embarkation Gate to Port Area (FM-301)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A

TABLE 4.7-2: SUMMARY OF CULTURAL IMPACTS – ALTERNATIVE 2B: SOUTH LOOP OPTION (CONTINUED)

NRHP-Listed, Eligible or Contributing Building, Structure, Object, Site, or Cultural Landscape Feature	Potential Project Impact(s)	Assessment of Project Impact(s)	Term	Potential Mitigation Measures
Fort Mason Turnaround Segment – South Loop (cont.)				
San Francisco Port of Embarkation Gatehouse (FM-302)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
San Francisco Port of Embarkation Guard Post (FM-303)	• Noise/vibration: streetcar operation • Visual: overhead contact system	Minor adverse	Long	N/A
Fort Mason Cultural Landscape Features: Specimen trees west of Fort Mason Great Meadow	• Relocation of pedestrian paths • Removal of turf • Possible removal of specimen tree(s). • Noise/vibration: streetcar operation • Visual: overhead contact system	Moderate adverse	Long	• Avoid removal of specimen tree(s) • Replace specimen trees in-kind if removal is unavoidable
Potential archeological Site CA-SFr-29 at Fort Mason Great Meadow	• Ground-disturbing construction for turnaround	Negligible	Short	Worker education and inadvertent discovery mitigation

that qualify the District for inclusion in the National Register, and for designation as a National Historic Landmark. The District's integrity would be diminished, but not to the extent that Aquatic Park's eligibility for National Historic Landmark status or National Register listing would be jeopardized. Measures to mitigate these impacts are described below.

Impacts to San Francisco Port of Embarkation U.S. Army National Historic Landmark District/Fort Mason National Register Historic District

Impacts to the NHL District/National Register Historic District as a Whole: The introduction of streetcar tracks, an overhead contact system, lighting, signage, and passenger platforms would constitute an adverse impact to the historic setting, feeling, and association of the NHL and National Register Districts at Fort Mason. The partial demolition of a retaining wall associated with the Fort Mason Tunnel, and physical alterations to the tunnel and existing tracks, would adversely impact the design, materials and workmanship of the NHL District (retaining wall only) and the National Register Historic District (tunnel, tracks, and retaining wall). The addition of streetcar-associated noise, vibration, and new uses would adversely impact the historic feeling and association of the Districts. The overall impact of these changes is deemed as a moderate adverse impact to the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District because it

would result in the alteration or modification of one or more of the characteristics that qualify the Districts for inclusion in the National Register and/or as a National Historic Landmark. The Districts' integrity would be diminished, but not to the extent that it would jeopardize the listing status of either the Fort Mason National Register Historic District or the San Francisco Port of Embarkation U.S. Army NHL District. Measures to mitigate these impacts are described below.

Impacts to Known and Unknown Archeological Sites. Two recorded archeological sites are located in the APE. Site CA-SFr-23, a prehistoric shell midden site, is purportedly located near the intersection of Hyde and Beach Streets and was last recorded in 1954. Although no evidence of the site is currently visible it is possible that subsurface cultural material is present. Site CA-SFr-29, a pre-contact habitation site, was originally recorded in the western portion of the Fort Mason Great Meadow in 1978. Test excavations to identify the exact location of this site in 2010 revealed no cultural materials immediately below the ground surface, although a single auger core revealed culturally altered sediments at a depth of nearly one meter. This auger core was taken from outside the area that would be impacted by construction for Alternative 2B: South Loop (Holman & Associates 2010).

Ground-disturbing activities related to installation of new tracks at Hyde and Beach Streets could disturb cultural materials at site CA-SFr-23 if present beneath the ground surface. Similarly, ground-disturbing activities in the Great Meadow associated with construction of Alternative 2B: South Loop could disturb cultural materials at site CA-SFr-29 if present beneath the ground surface. Although the impact is negligible because no cultural materials are anticipated in these areas, measures described below would nonetheless mitigate the potential for damage due to inadvertent discovery. Damage to previously unknown and unrecorded archeological resources due to ground-disturbing construction activities could also occur anywhere along the ROW, given the area's archeological sensitivity. As such, the measures described below would also mitigate the potential for damage of previously unknown archeological resources.

Cumulative Impacts. Cumulative effects to cultural resources should consider the reasonably foreseeable actions in the APE and immediate vicinity in addition to potential effects of the proposed action. The projects identified include those which could affect cultural resources within the APE or immediate vicinity by substantially altering or impairing them, as well as ground-disturbing activities in archeologically sensitive areas.

There are a number of projects planned within or in the vicinity of the APE. Two projects at the Port of Embarkation, U.S. Army NHL District/Fort Mason Historic District, include seismic upgrades to Building E and a solar panel installation project on the roof of the Pier 2 Shed. Projects at San Francisco Maritime NHP include the Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Aquatic Park Bathhouse Exhibit Plan and Installation. Other projects in proximity to the APE include the San Francisco Marina Renovation Project; Fort Mason Bay Trail at Laguna Street and Marina Boulevard; 721 Beach Street Development and the Fisherman's Wharf Public Realm Plan.

Implementation of standard mitigation measures to ensure the protection of both known and unknown cultural resources are included in the various environmental documents which have evaluated, or will evaluate, the environmental effects of each of these projects. In addition, effects to

historic properties at any of the projects located on NPS-managed properties would be required to comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties, further mitigating the intensity of the effects to cultural resources. All reasonably foreseeable projects would also have to undergo additional environmental review, thus ensuring further consideration and minimization of effects.

Projects such as the Aquatic Park Bathhouse Exhibit Plan and Installation, San Francisco Maritime NHP Municipal Pier Rehabilitation Project, and Seismic Upgrades to the Maritime Heritage Learning Center, specifically, would be subject to the provisions in the Aquatic Park Cultural Landscape Report, which is intended to minimize adverse effects to the Aquatic Park cultural landscape. Similarly, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Seismic Upgrades to Building E of the San Francisco Maritime NHP, and the Pier 2 Shed Solar Installation Project, would be subject to the Fort Mason Cultural Landscape Report, which is intended to minimize adverse effects to both the San Francisco Port of Embarkation, U.S. Army NHL District and the Fort Mason National Register Historic District. The Pier 2 Solar Panel Installation Project, specifically, was evaluated by the California SHPO and the Heritage Preservation Services Division of the National Park Service in October, 2010, which determined that this tax incentive project would comply with the Secretary of the Interior's Standards for Rehabilitation (see enclosure). Finally, effects to both known and unknown archeological resources as a result of any or all of these projects would be mitigated by implementing standard worker education and inadvertent discovery measures, and as required by NEPA and Section 106 of the NHPA. Therefore, based on available information, these projects in and of themselves are unlikely to have adverse effects on historic properties within the APE. However, when combined with the proposed undertaking to extend the streetcar service, which is considered on its own merits to be an adverse effect, the cumulative effect to historic properties would be considered moderate adverse.

The measures identified below to mitigate the effects of the undertaking at a project level would also be implemented to mitigate the effects at a cumulative level.

Mitigation Measures. The measures below have been designed to mitigate adverse effects pursuant to the requirements of NEPA and of Section 106 of the NHPA. A Memorandum of Agreement (MOA) will be developed between NPS and the SHPO to document the recommended mitigation measures for compliance with Section 106.

CUL-1: Measures to mitigate the adverse impacts of the loss of individual resources at Aquatic Park NHL District (stone retaining wall) include the following:

- Conduct Historic American Building Survey (HABS), and/or Historic American Landscape Survey (HALS) documentation of the stone retaining wall.
- Retain/reuse stone wall materials in new construction as appropriate.
- Interpretation of wall history and its contribution to the cultural landscape

CUL-2: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the Aquatic Park NHL District include the following:

- HABS/HALS documentation, focused on the western area of Aquatic Park. Documentation of the stone retaining wall, described above, can be incorporated into this effort.
- Ensure that all new design elements, such as overhead contact poles and platforms, are compatible with the Streamline Moderne architecture of Aquatic Park. To preserve views of San Francisco Bay, the platforms should be devoid of roofs.
- Restore the Beach Street and western Aquatic Park landscape in accordance with the Aquatic Park Cultural Landscape Report.
- Install appropriate landscaping elements along the Beach Street portion of Victorian Park in accordance with the Aquatic Park Cultural Landscape Report.
- Public interpretation of Aquatic Park history in the western portion of the park, potentially integrated with new station platforms to maximize visitation. Interpretation of wall history, described above, could be included in this effort.
- Implement measures for reduction of noise/vibration as described in Section 4.6 of this document.

CUL 3: Measures to mitigate the adverse impacts of the alteration of individual resources at San Francisco Port of Embarkation U.S. Army NHL District and Fort Mason National Register Historic District include the following:

- HABS/HALS documentation that includes tunnel portals, railroad tracks (FM-406), and retaining wall at west portal
- Interpretation of the Fort Mason Tunnel's historic use
- Stabilize tunnel walls with compatible materials
- Retain existing fabric wherever possible
- Interpretation of historic rail service at the San Francisco Port of Embarkation
- Avoid removal of specimen tree(s) in Fort Mason Great Meadow, and replace specimen trees in-kind if removal is unavoidable, in accordance with the Fort Mason Cultural Landscape Report (Alternative 2B: South Loop Option only).

CUL 4: Measures to mitigate the adverse impacts due to the introduction of new, incompatible uses to the San Francisco Port of Embarkation U.S. Army NHL District/Fort Mason National Register Historic District include the following:

- Conduct HABS/HALS documentation, focused on the western area of Lower Fort Mason but inclusive of all contributing elements that may be adversely impacted by the Proposed Project. Documentation of the tunnel portals, tunnel retaining walls, and railroad tracks described above can be incorporated into this effort.
- Ensure that all design elements, such as overhead contact poles and platforms near the Fort Mason Center are compatible with the architectural character of Lower Fort Mason. In order to reduce visual impacts, the platforms should be devoid of roofs.
- Public interpretation of San Francisco Port of Embarkation/Fort Mason history in the western portion of the site, potentially integrated with new station platforms to maximize visitation. Interpretation of historic rail service, described above, could be included in this effort.

CUL-5: Measures to mitigate negligible impacts to archeological resources due to inadvertent discovery during ground-disturbing activities include the following:

- Cultural Resources Education for Workers. NPS would provide training to all members of the construction team. Training would involve information regarding what types of cultural materials are likely present in the project area, how to identify cultural materials, and the procedures for contacting the appropriate parties in the event that cultural materials are encountered during construction activities. All construction personnel would be required to participate in the training, and written guidelines would be prepared and distributed to aid in identification of cultural materials and to inform workers of the procedures to follow in case of a discovery or potential discovery.

- Construction Monitoring in Vicinity of Reported Site CA-SFr-23. A qualified archeological monitor and/or Ohlone Tribal representative shall be present to observe ground-disturbing project construction activities at the Hyde/Beach Street intersection, the reported location of indigenous site CA-SFr-23. Given the highly sensitive nature of this area for archeological resources, construction personnel should be prepared to immediately cease any excavation or grading work if so directed by the monitor.

- Discovery of Archeological Resources During Construction. If buried cultural resources such as chipped stone or groundstone, historic debris, building foundations, or human bone are inadvertently discovered during ground-disturbing activities, work shall stop in that area and within a 100-foot radius of the find until a qualified archeologist can assess the significance of the find.

  Inadvertent discoveries would be treated in accordance with 36 CFR 800.13 (Protection of Historic Properties: Post-review discoveries). The archeological resource would be assessed for its eligibility for listing on the NRHP in consultation with the SHPO and Ohlone/Costanoan Representatives (if it is an indigenous archeological site) and a determination of the project effects on the property would be made. If the site would be adversely affected, a treatment plan would also be prepared as needed during the assessment of the site's significance. Assessment of inadvertent discoveries may require archeological excavations and/or archival research to determine resource significance. Treatment plans would fully evaluate avoidance, project redesign, and data recovery alternatives before outlining actions proposed to resolve adverse effects.

  If human skeletal remains are encountered, protocols under either federal or state law may apply depending on the jurisdiction. Regardless, all work shall stop in the vicinity of the discovery, and the find would be secured and protected in place.

  The San Francisco County coroner and Park Archeologist would both be immediately notified. If a determination finds that the remains are Native American, and that no further coroner investigation of the cause of death is required, the coroner would then be required to contact the NAHC (pursuant to Section 7050.5[c] of the California Health and Safety Code) and the County Coordinator of Indian Affairs. If the remains are on federal land or under federal jurisdiction, they would also be treated in accordance with the Native American Graves Protection and Repatriation Regulations at 43 CFR 10.4 (Inadvertent discoveries).

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4.8 RECREATION AND VISITOR USE

4.8.1 Methodology and Assumptions

Potential effects on recreation and the visitor experience were evaluated consistent with the criteria presented in *Analysis Thresholds* below. The area of focus for study include: Fort Mason, San Francisco Maritime NHP, and amenities in the Fisherman's Wharf area including Ghirardelli Square. This entailed identifying the physical changes in site conditions within the existing recreational area expected to occur under each alternative and then evaluating whether any anticipated site changes would be likely to:

- alter visitor perception of Fort Mason, San Francisco Maritime NHP, and amenities in the Fisherman's Wharf area including Ghirardelli Square, or enjoyment of existing uses at these sites;
- eliminate or reduce existing uses, or provide new and/or beneficially modified uses;
- otherwise contribute to increases or decreases in use at the site.

The analysis will address short-term (temporary) construction-related impacts and long-term (permanent) site changes resulting from all alternatives of the proposed project. All anticipated changes in site condition (temporary and long-term) were evaluated under the following criteria, which reflect factors identified as essential to the quality of the visitor experience.

- Access to the sites.
- Vehicle, bicycle, public transit, and pedestrian access to, from, and within the area.
- Recreational opportunities and visitor experience
- Availability and quality of various recreational opportunities, such as walking/hiking, dining, site seeing, harbor use, etc.
- Public safety during short-term construction related activities.

NPS also identifies safety of visitors and area residents as a priority. Accordingly, construction activities were also analyzed for their potential to affect the safety of visitors and area residents, including all age groups and those with disabilities. Pedestrian and vehicle conflicts are analyzed in Section 4.4 Transportation and Circulation. All facilities would be designed and operated to meet applicable safety and accessibility (ADA) standards.

Effects on recreation and the visitor experience were evaluated as negligible, minor, moderate, or major, based on the thresholds described below.

Impact Intensity	Impact Description
Negligible:	Alternative would result in little or no noticeable change in visitor experience or appreciation of the site, or recreation opportunities. Visitors are likely unaware of the effects associated with proposed changes at the site.

Impact Intensity	Impact Description
Minor:	Alternative would result in changes detectable to the areas visitors and residential community, but would not affect normal visitor use or reduce visitor enjoyment of the area. Visitors would be aware of the effects associated with the changes proposed; however, alterations in visitor use and experience would be slight. Other aspects of the visitor experience would remain available for visitor use and enjoyment without degradation of site resources and values.
Moderate:	Alternative would result in changes readily apparent to the visitor and residential community, and would affect visitor use. Access and/or recreational opportunities would be altered, and use of the area would be measurably affected (visitors could either be more satisfied or less satisfied). Some visitors would be likely to pursue their recreational choice at another location.
Major:	Alternative would result in changes that would be highly noticeable to the visitor and residential community, and intrusive to the visitor experience. Alternative would also likely change the character of the landscape or soundscape, and/or change important vistas or keystone features of the site. Original, pre-project perceptions of the area and traditional visitor uses at the site would be highly altered. Some visitors wishing to continue their use and enjoyment of walking/hiking, dining, sightseeing, harbor use, etc would be required to pursue their choice in other available local or regional areas to obtain the desired experience.

4.8.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. There would be no changes to existing recreational opportunities or visitor use in the Fort Mason, San Francisco Maritime NHP, and amenities in the Fisherman's Wharf area including Ghirardelli Square, under Alternative 1. Visitor perceptions and enjoyment of Fort Mason, San Francisco Maritime NHP and amenities in the Fisherman's Wharf area would remain unchanged. No existing uses would be altered or eliminated, and no new uses would be provided under Alternative 1. Local and visitor use of the recreational opportunities in the area would remain the same, with an expected commensurate increase as local population levels rise in the coming years. Local public transit accessibility of Fort Mason, San Francisco Maritime NHP and the Fisherman's Wharf area would continue to require a minimum of two transfers. This indirect link to the area on public transit would continue to deter use for some local visitors, conference attendees and tourists.

As no construction activities are proposed under Alternative 1, there would be no expected short-term changes to site access or area access to and from the sites, no temporary changes to recreational opportunities, and no public safety concerns to address.

Cumulative Impacts. Cumulative effects to recreation and visitor use are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect recreation and visitor use within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on recreation and visitor use include the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fort Mason Cultural Landscape, Fort Mason Sidewalk Replacement, Fort Mason Hazard Tree Replacement, upper Fort Mason Entry at Bay and Franklin Streets, Removal of Accessibility Barriers in upper Fort Mason. The beneficial impacts would result from improving safety and accessibility of features within the project study area. The Bay Trail at Laguna Street and Marina Boulevard was

recently renovated and expanded to alleviate congestion at "the squeeze", however the Project would not undermine the newly expanded area. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to recreation and visitor use within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Fort Mason Center Pier 2 shed restoration, Maritime Heritage Learning Center, and Doyle Drive are for the most part improvements to existing facilities in the long-term but could result in short-term adverse impacts to recreation and visitor use during construction. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-generated activity in areas that may have a high density of recreational use, including pedestrians, and bicycles, however they would not significantly change the recreation and visitor use in the respective areas of these projects. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to recreation and visitor use.

Collectively, the cumulative projects discussed above would have a long-term, minor to moderate, beneficial impact to recreation and visitor use within the project area.

The impacts of Alternative 1, when combined with the impacts of the cumulative projects described above, would result in a long-term, minor to moderate, beneficial cumulative impact and short-term, minor to moderate, adverse impact on recreation and visitor use in the project area.

Conclusions. The No Action alternative would result in no measurable change to recreational opportunities or visitor use in Fort Mason, San Francisco Maritime NHP, and amenities in the Fisherman's Wharf area including Ghirardelli Square.

4.8.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. Phased road closures at the intersection of Hyde and Beach streets could have potential negative impact on tourism to Ghirardelli Square. Road closures due to construction activities are discussed further in Section 4.4 Transportation and Circulation.

The at-grade crossing of Powell/Hyde Street cable car line (Line 60) at Hyde and Beach streets would require the loss of this cable car line for as much as one month. The temporary loss of the Powell/Hyde cable car is discussed further in Section 4.4 Transportation and Circulation.

Installation of traffic signals to accommodate streetcar operations would cause a potential disruption to tourist traffic in the Fisherman's Wharf area. Disruptions to pedestrian, automobile and bicycle traffic resulting from construction activities are discussed further in Section 4.4 Transportation and Circulation.

Under Alternative 2, the bocce ball courts on the corner of Van Ness and Beach streets within Aquatic Park may need to be relocated to an area that has yet to be determined. The National Park Service is

committed to replacing the bocce ball court and would evaluate suitable alternatives during a separate planning effort and in conjunction with the new General Management Plan for the San Francisco Maritime NHP that is scheduled to begin in late 2011. The timescale for re-opening of the bocce ball courts has yet to be determined. Relocation of the bocce ball courts would produce a moderate, temporary impact to recreational opportunities and the visitor experience.

Operation of the F-line extension as proposed in Alternative 2 is expected to have a moderate, beneficial effect on the visitor perception and enjoyment of the Fisherman's Wharf area, Ghirardelli Square, Fort Mason and the San Francisco Maritime NHP. The Project, as designed, would increase public access to the area's attractions by extending public transportation to these amenities, with station platforms conveniently placed directly adjacent or in the attractions themselves. By decreasing the number of transfers required to access the area on public transit, local users from within the Bay Area would have increased opportunities to enjoy the attractions. Furthermore, tourists and others, who may not utilize the F-line extension, are likely to enjoy viewing the functioning historic streetcars as a compliment to the area's historic feel.

Increased public transportation access could result in increased visitor use and subsequent increased wear to park facilities. The proposed project is anticipated to increase the number of visitors in Fort Mason, San Francisco Maritime NHP, and amenities in the Fisherman's Wharf area including Ghirardelli Square. It is difficult to accurately predict which attractions and recreational opportunities would experience the most increases in public use; however, it follows that an increase in use would result in increased need for park maintenance to maintain the current level of visitor experience. Increased maintenance may be required to clear out trash bins, clean and restock public restrooms, repair vandalism, maintain trails, and/or other routine maintenance activities. If park management does not increase person-hours for maintenance at the park facilities, degradation in the visitor experience may result. This impact may result in a moderate, adverse impact to recreation within the area.

Alternative 2A: North Loop Option. Noise from construction activities may temporarily disrupt some events at the Fort Mason Center, particularly in Landmark Building A. Temporary noise impacts to Fort Mason from construction activities are further discussed in Section 4.7 Noise and Vibration.

The construction lay down area may further reduce potential parking at Fort Mason. Although a lay down area has not been identified for the North Loop Option, it is likely that the Fort Mason parking lot would be utilized for construction staging. This would cause the loss of additional parking spaces that serve the Fort Mason Center. This temporary adverse impact is considered short-term and minor.

Utilization of the North Loop option for Alternative 2 would result in the loss of 35 parking spaces within the Lower Fort Mason Parking Lot which equates to an 8 percent loss of the existing 440 parking spaces. This lot is the closest to the Fort Mason Center which is utilized for approximately 11,400 events annually with as many as 7,000 attendees at the largest events. For various reasons including poor access by public transit, the primary access and mode of transportation to Fort Mason Center is by automobile and parking within this lot is known to be inadequate for demands during popular events. Under the current situation, parking already spills over into neighborhoods and Fisherman's wharf area parking facilities. Some users may be dissuaded from attended events at the

Fort Mason Center as a result of the increased difficulty in finding parking, while others may choose to utilize the extended F-line.

Construction of the North Loop option could affect the insufficient parking situation for recreational users of the Fort Mason Center. No additional parking has been proposed to compensate for the loss of 35 parking spaces as the project provides an alternative means of transportation to the Fort Mason Center. This impact is considered a minor, long-term adverse impact; no mitigation is currently proposed to off-set the impact.

Conclusion. Alternative 2A: North Loop Option would result in short and long-term minor adverse impacts.

Alternative 2B: South Loop Option. Construction of the South Loop would result in a temporary disruption to use of the San Francisco Bay Trail with meanders along the northern edge of the Great Meadow and cuts through the area proposed for the South Loop Option. Users of the San Francisco Bay Trail would be required to cut across the meadow's grassy fields, reroute to stairs that connects to the Fort Mason Center parking lot, or possibly cross Laguna and Marina streets to reconnect with the Bay Trail to the east of Fort Mason.

Construction activities may cause a visual and auditory disruption to recreational activities within the Great Meadow. Temporary noise impacts to individuals utilizing the Great Meadow during construction activities are further discussed in Section 4.7 Noise and Vibration.

The construction lay down area would further reduce potential parking at Fort Mason. Although a lay down area has not been identified for the South Loop Option, it is likely that the Fort Mason parking lot would be utilized for construction staging. This would cause the loss of additional parking spaces that serve the Fort Mason Center. This temporary adverse impact is considered short-term and minor.

As a result of the proposed option, less than one acre of open space within the Great Meadow would be converted to looping tracks and station platform. This would reduce the area available for recreational activities within the meadow. As the Fort Mason area of San Francisco is already densely and completely developed, there is little opportunity to mitigate this permanent loss to open space. Seekers of open space could utilize nearby areas, some of which also offer attractive views of the San Francisco Bay and/or Golden Gate Bridge. The northern shore of San Francisco contains many other existing options of open space, including nearby Crissy Fields, the Marina Green, Victorian Park, the Presidio and adjacent beaches. Because the immitigable loss of less than one acre of the Great Meadow that offer attractive views of the Golden Gate Bridge may cause a small portion of current park visitors to seek recreational opportunities at another location, this permanent adverse impact is minor.

Construction of the South Loop would directly cross a portion of the San Francisco Bay Trail that connects the Bay Trail eastern in the Great Meadow to the sidewalk along Laguna Street. Because an intersection of the trail and rail creates an unsafe pedestrian crossing, this portion of the Bay Trail would be eliminated and a new section of trail would be created that meanders around the upper margins of the proposed loop and connects to the sidewalk along Laguna Street nearer to the corner of Laguna and Bay streets. This trail would be longer than the current trail with the Great Meadow and would occupy more distance along the Laguna Street sidewalk. As a result of the increased distance along Laguna Street, the

Bay Trail would have a shared interface with the F-line rail platform. This would potentially create an unsafe situation for disembarking passengers and bicyclists using the Bay Trail.

Conclusion. Alternative 2B: South Loop Option would result in short and long-term minor adverse impacts.

Cumulative Impacts. The impacts of the other actions (past, present, and reasonably foreseeable future actions) for recreation and visitor use under Alternative 2 would be the same as described under Alternative 1. See the discussion of cumulative effects under Alternative 1.

Collectively, the cumulative projects discussed above would have a long-term, minor to moderate, beneficial impact to recreation and visitor use within the project area. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to recreation and visitor use.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would result in a long-term, minor to moderate, beneficial cumulative impact and short-term, minor to moderate, adverse impact on recreation and visitor use in the project area.

Mitigation Measures

REC-1: If necessary, relocate the bocce ball courts to suitable location. Prior to the start of construction, the NPS shall initiate a planning project to determine suitable alternative locations for the bocce ball courts. The bocce ball court should preferably be relocated within a quarter-mile from the existing location on federal- or City of San Francisco-owned land.

REC-2: Post signage to direct Bay Trail users of temporary re-routes. At the Van Ness Avenue and Great Meadow intersections of the Bay Trail and proposed F-line extension, the NPS shall post adequate signage notifying the public of the re-routed Bay Trail.

REC-3: Coordinate the Bay Trail reroutes with Association of Bay Area Governments (ABAG). To ensure temporarily and permanently rerouted Bay Trail segments meet the policies and guidelines of the Bay Trail Plan, the NPS shall coordinate trail details with ABAG. Where the Bay Trail and the F-line extension intersect, the Bay Trail shall be clearly and well physically separated from the rail alignment to ensure public safety. This shall include areas where passengers are disembarking from the streetcar onto the Bay Trail route to prevent collisions between Bay Trail bicycle and pedestrian users and public transit users.

Conclusions. Alternative 2 would have short-term and long-term, minor, adverse impacts on recreation and visitor use in the project area.

4.9 VISUAL AND AESTHETIC RESOURCES

4.9.1 Methodology and Assumptions

The analysis of visual resources for the study area is based on viewsheds found within the three project segments: Turnaround Segment; Transition Segment; and In-Street Segment. Ten important viewpoints were identified within these segments for further evaluation.

Impacts for each alternative are described based on the analysis performed at the ten important viewpoints, as well as an overall assessment of the alternative's ability to preserve scenic qualities of the planning area, including scenic vistas, historic resources and landforms. The assessment of impacts considers whether the resulting visual change would have an adverse or beneficial effect on a viewshed, would substantially damage or improve scenic resources, or substantially degrade or improve the existing visual character of the site. The assessment also evaluates each alternative's consistency with applicable NPS design goals and policies, including preservation of the National Historic Landmark Districts and compatibility of design features within the NHLD, and with standard visual impact criteria. Visual simulations prepared from key observation points from the three priority sites are included in this section.

Impact Intensity	Impact Description
Negligible:	Would result in little or no detectable change in visual character or views of the site.
Minor:	Changes to the visual character and views of the site would be detectable, but the landscape has the capability to visually absorb and incorporate most of the changes. Changes would not appreciably alter important landscape characteristics, and views would change only slightly, so as not to negatively affect scenic quality.
Moderate:	Changes to the visual character and views of the site would be readily noticeable. One or more secondary features of views of the site would be altered, but effects would be short-term and/or the keystone features of the views would remain intact.
Major:	Changes to the visual character and views of the site would be highly noticeable and severe, such as the original, pre-project landscape would be altered beyond recognition. Keystone features of views would change.

4.9.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Alternative 1 establishes the baseline for comparing the action alternative since it represents no change from the existing management direction or level of management intensity. The No-Action Alternative would not facilitate transit connectivity or accessibility nor increase access to NPS facilities beyond those measures identified in the management plans.

Turnaround Segment: No changes are proposed in the Turnaround Segment under Alternative 1; therefore the existing visual character of Upper Fort Mason and Lower Fort Mason in the GGNRA as depicted in the five viewsheds identified for analysis would remain the same.

Transition Segment: No changes are proposed in the Transition Segment under Alternative 1; therefore the existing visual character of the San Francisco Maritime NHP as depicted in the two viewsheds identified for analysis would remain the same.

In-Street Segment: No changes are proposed in the In-Street Segment under Alternative; therefore the existing visual character of the San Francisco Maritime NHP as depicted in the two viewsheds identified for analysis would remain the same.

Cumulative Impacts. Alternative 1 would have no direct or indirect impacts on visual resources. As a result, there would be no cumulative impacts under this alternative.

Conclusions. Alternative 1 would not result in any direct, indirect, or cumulative impacts to visual resources.

4.9.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. Alternative 2-Action Alternative would introduce new elements to the landscape associated with the infrastructure of the Historic Streetcar including: tracks, streetcars, overhead wires and lights, signals, and platforms.

The overhead contact system (OCS) is assumed to be a simple, single-wire system similar to the existing Muni OCS on the F-line trackage in the Fisherman's Wharf area on Jefferson, Jones and Beach Streets. The system assumed would be configured for trolley pole operation by historic streetcars. Poles would be spaced approximately every 100 feet on tangent track. On streets with only one track the OCS will normally be suspended from a mast arm attached to a pole on the sidewalk, (similar to current poles and mast arms on Jefferson and Beach Streets), incorporating decorative streetlights similar to those used for the F-line project (URS 2009e).

Alternative 2A: North Loop Option. Project construction activities would result in temporary exposure of graded surfaces, construction debris and the presence of construction equipment and truck traffic. Construction equipment for grading activities would be stored at various locations throughout the Project site. In addition, the identification and maintenance of staging areas away from heavily traveled roadways and sidewalks would reduce these short-term adverse impacts. Implementation of mitigation measures would reduce these short-term aesthetic impacts to minor adverse impacts.

Alternative 2B: South Loop Option. Project construction activities would result in temporary exposure of graded surfaces, construction debris and the presence of construction equipment and truck traffic. Construction equipment for grading activities would be stored at various locations throughout the Project site. In addition, the identification and maintenance of staging areas away from heavily traveled roadways and sidewalks would reduce these short-term adverse impacts. Implementation of mitigation measures would reduce these short-term aesthetic impacts to minor adverse impacts.

Turnaround Segment. **Figures 4.9-1** and **4.9-2** – Changes depicted in the conceptual visual simulation of the North Loop Turnaround show the addition of the streetcar where it would be visible between the main gate at Lower Fort Mason and the gatehouse and the introduction of overhead poles and

Existing view - Marina Boulevard at Laguna Street looking northeast

Conceptual visual simulation of North Loop alternative

Source: Environmental Vision

VISUAL SIMULATION MARINA BOULEVARD (NORTH LOOP – CLOSE IN)

Draft Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 4.9-1

Existing view - Marina Boulevard near Laguna Street looking east (panorama)

Conceptual visual simulation of North Loop alternative

VISUAL SIMULATION MARINA BOULEVARD (NORTH LOOP)

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FIGURE 4.9-2

Source: Environmental Vision

wires. These views (both close-up and long-range) depict change in the background of the vantage point and would result in a minor adverse long-term impact because the change would be detectable, but the landscape has the capability to visually absorb and incorporate most of the changes.

Figure 4.9-3 – Changes depicted in the conceptual visual simulation of Alternative 2B: South Loop Turnaround shows the addition of the streetcar where it would be visible after it emerges from the Fort Mason Tunnel and turns south to the Great Meadow. This visual simulation shows the introduction for the station platform and overhead canopy as well as overhead poles and wires. These changes in the middleground of this vantage point would be detectable, but the landscape has the capability to visually absorb and incorporate most of the changes, resulting in a minor adverse long-term impact.

Figure 4.9-4 – The conceptual visual simulation of Alternative 2A: North Loop from the Fort Mason Building C stairway looking south is depicted in this photo. This vantage point introduces major visual changes in the foreground of the view including the historic streetcar, tracks and trackbed, overhead wires and lights as well as station platform and overhead canopies. The introduction of these new visual elements has direct impacts on the visual resources of Building A in the San Francisco Port of Embarkation (Fort Mason) NHLD. While the introduction of these elements would be readily noticeable, the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

Figure 4.9-5 – The conceptual visual simulation of Alternative 2B: South Loop from the intersection of Laguna Street and North Point Street looking north is depicted in this photo. This vantage point shows the South Loop retaining wall as a major visual element introduced into the Great Meadow.

The retaining wall would be approximately 5-10 feet tall. It replaces a landscaped setting and approximately five small trees. The historic streetcar, station platform, overhead canopies as well as overhead wires and lighting are additional visual elements introduced into the middleground of this vantage point. While the introduction of these elements would be readily noticeable, the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

Figure 4.9-6 – The conceptual visual simulation of Alternative 2B: South Loop of the Fort Mason path looking northwest is depicted in this photo. This viewpoint depicts an important historic viewshed as identified in the Cultural Landscape Report (CLR) for Fort Mason: Golden Gate National Recreation Area (2004). The CLR identifies the important viewshed from Upper Fort Mason of the view to the Golden Gate Bridge from Great Meadow. The conceptual simulation shows that even with the introduction of new visual elements into this area, the view to the Golden Gate Bridge remains unobstructed. The new visual elements include the historic streetcar, station platform, overhead wires and lighting, realignment of the Bay Trail, hand railing and retaining wall, tracks, and a vegetated island within the inner track loop. Five small trees would be removed as part of this alternative, however the CLR emphasizes that the growth of vegetation in and around Fort Mason actually detracted from the historic viewshed of the Golden Gate Bridge and the San Francisco Bay. In addition, historically this view was obstructed by buildings, whereas today, the views are and would continue to be open even with the implementation of the South Loop option. While the introduction of these elements would be readily noticeable, the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, minor, adverse effect.

Existing view - Marina Boulevard near Laguna Street looking east (panorama)

Conceptual visual simulation of South Loop alternative

VISUAL SIMULATION MARINA BOULEVARD (SOUTH LOOP)

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FIGURE 4.9-3

Source: Environmental Vision

Existing view - Fort Mason Building C stairway looking south

Conceptual visual simulation of North Loop alternative

Source: Environmental Vision

Note: Parking will be removed from this area for operational and pedestrian safety

VISUAL SIMULATION FORT MASON (NORTH LOOP)

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Historic Streetcar Extension
San Francisco, California

FIGURE 4.9-4

Existing view - Laguna Street at North Point Street looking north

Conceptual visual simulation of South Loop alternative

Source: Environmental Vision

VISUAL SIMULATION LAGUNA AND NORTH POINT (SOUTH LOOP)

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FIGURE 4.9-5


Existing view - Fort Mason path looking northwest


Conceptual visual simulation of South Loop alternative

VISUAL SIMULATION FORT MASON PATH (SOUTH LOOP)

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FIGURE 4.9-6

Source: Environmental Vision

Transition Segment. **Figure 4.9-7** – This view captures the western edge of the Maritime Museum in the foreground of the right side of the photo and a portion of the Bocce Court in the left side of the photo in the middleground. The West Speaker Tower peaks up from the surrounding trees in the background. A walkway leads from the front of the Maritime Museum to the promenade at Aquatic Park. The conceptual simulation shows the proposed platform and path. The view of the museum is not changed and the historic Speaker Tower is actually more prominent with the removal of vegetation that would be required in this location. While the introduction of these elements would be readily noticeable, the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

Figure 4.9-8 – Visual resources from this vantage point, include the Aquatic Park NHLD. Contributing features to the NHLD includes the Maritime Museum, West Speaker Tower, the State Belt Railroad Tracks, and the paved walkway system from Van Ness Avenue past the West Speaker Tower. Ghirardelli Square is in the background. The conceptual simulation shows the proposed platform and path and two street cars. The view of the museum and Ghirardelli Square is not changed and the historic Speaker Tower is actually slightly more prominent with the removal of vegetation that would be required in this location. While the introduction of these elements would be readily noticeable, the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

In-Street Segment. **Figure 4.9-9** – The Maritime Museum is the focal point of this view at the intersection of Polk Street and Beach Street. There is a pedestrian walkway in front of the Museum and three crosswalks at this intersection allow pedestrians to directly access the Museum entrance from the opposite side of the street.

The conceptual simulation shows a street car and two poles and the overhead wire. The view of the museum is not significantly changed. The introduction of the streetcar in this vantage point is readily noticeable, however the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

Figure 4.9-10 – This view shows the two-lane east-bound and one-lane west-bound street in the foreground. Parking spaces line both sides of the street. Street venders occupy the north-side of the street on the sidewalk in the middleground. Victorian Park is not visible in this view, but it is located adjacent to the north sidewalk behind the street venders. The Cable Car NHLD turnaround is at the Hyde Street intersection within Victorian Park in the background. Streetlamps are positioned at the corner of Hyde Street. The conceptual simulation shows two street cars, corresponding poles and overhead wires and the platform in the easterly direction. The introduction of these elements in this vantage point is readily noticeable, however the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term, moderate, adverse effect.

Existing view (photos taken during 2010 renovations) - Beach Street near Polk Street looking northwest

Conceptual visual simulation of Proposed Project

Source: Environmental Vision

VISUAL SIMULATION TRANSITION SEGMENT

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Historic Streetcar Extension
San Francisco, California

FIGURE 4.9-7

Existing view (photos taken during 2010 renovations) - Van Ness Avenue looking south

Conceptual visual simulation of Proposed Project

Source: Environmental Vision

VISUAL SIMULATION TRANSITION SEGMENT

Draft Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE 4.9-8

Existing view - Polk Street at Beach Street looking north

Conceptual visual simulation of the proposed project

Source: Environmental Vision

VISUAL SIMULATION IN-STREET SEGMENT (POLK AT BEACH)

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Historic Streetcar Extension
San Francisco, California

FIGURE 4.9-9

Existing view - Beach Street near Hyde Street looking east

Conceptual visual simulation of Proposed Project

Source: Environmental Vision

VISUAL SIMULATION IN-STREET SEGMENT (BEACH NEAR HYDE)

Draft Environmental Impact Statement
Historic Streetcar Extension
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FIGURE 4.9-10

Mitigation Measures

The NPS shall ensure that all construction contracts for the proposed Project incorporate and implement the following measures:

> **VIS-1:** To the extent feasible, during all site preparation and exterior construction activities, the NPS and its contractors shall place and maintain a screened security fence around the perimeter of the project site and removed upon completion of construction activities. The NPS shall determine the height, material and placement of such fencing, as appropriate and effective given the relative change in elevation and viewpoints to the site.
>
> **VIS-2:** To the extent feasible, construction staging areas shall be located to the largest extent possible away from view of public viewsheds and remain clear of all trash, weeds and debris etc. Construction staging areas may include other areas of the project site when necessary, but shall be located away from adjacent properties, to minimize visibility from public view to the extent feasible.
>
> **VIS-3:** Signs will be limited to the minimum necessary to meet information, warning, and regulatory needs and to avoid confusion and visual intrusion.

Cumulative Impacts. Cumulative effects to visual and aesthetic resources are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect visual and aesthetic resources within the project area.

Past, present, and reasonably foreseeable projects include the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fort Mason Cultural Landscape, Fort Mason Sidewalk Replacement, Fort Mason Hazard Tree Replacement, upper Fort Mason Entry at Bay and Franklin Streets, Removal of Accessibility Barriers in upper Fort Mason, Pier 2 shed restoration, San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive. The adverse effects of these projects would be localized and short-term in nature, and primarily related to construction-generated activity such as staging of material and equipment in areas in and around the national parks; however they would not significantly change the visual and aesthetic resources for the long-term in the respective areas of these projects. Activities related to the construction of the reasonably foreseeable projects would result in a short-term, minor to moderate, adverse impact to visual and aesthetic resources.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a local, short-term and long-term, minor to moderate, adverse cumulative impact on visual and aesthetic resources in the project area.

Conclusions. Overall, Alternative 2-Action Alternative changes the visual landscape along the alignment of the project, but the pre-project landscape would not be altered beyond recognition, therefore the resulting impact would be a long-term moderate adverse impact.

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4.10 NIGHT SKY VISIBILITY AND LIGHT POLLUTION

4.10.1 Methodology and Assumptions

The night sky visibility and light pollution impact assessment process involves identification of the following:

- existing nighttime visual resources (i.e., night sky, attractively lit structural icons such as the Ghirardelli Square sign, etc.), including their visual character and quality, within the region, the immediate action area, and the project site
- properties within 200 feet of proposed artificial light locations within the action area using descriptions, maps and photographs
- sensitive receptors to night time light pollution generally considered residential buildings and hospitals/convalescence facilities

The degree of impact considered both the magnitude of change in the visual resource (i.e., visual character and quality) and viewers' responses to and concern for those changes.

To determine impacts, the following methods and assumptions will be used to evaluate changes that could occur with implementation of the alternatives.

- A review of state and local ordinances, and regulations and professional standards pertaining to lighting standards and visual quality will be conducted.
- Direct field observation conducted at night and day from multiple vantage points around proposed public transit stops.
- Review of nighttime photographs taken of existing visual resources and sensitive receptors.
- Individual impacts were considered to be those that would result in direct or indirect changes to existing night sky visibility, and night time viewsheds within the action area.

Impact Intensity	Impact Description
Negligible:	Would result in little or no detectable change in night time visual character or views of the site.
Minor:	Changes to the night time visual character and views of the area would be detectable, but the landscape has the capability to visually absorb and incorporate most of the changes. Would not appreciably alter important landscape characteristics, and view intactness would change only slightly, so as to not negatively affect scenic quality.
Moderate:	Changes to the nighttime visual character and views within the area would be readily noticeable. One or more views of the site would be altered, but sensitive receptors are likely to consider the changes inconsequential to the existing viewshed.
Major:	Changes to the visual character and views of the site would be highly noticeable and severe, such that the original, pre-project night time condition would be altered beyond recognition. Keystone features of views would change.

4.10.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Alternative 1 establishes the baseline for comparing the action alternative since it represents no change from the existing management direction or level of management intensity. Alternative 1 would not facilitate transit connectivity or accessibility nor increase access to NPS facilities beyond those measures identified in the management plans. No new sources of lighting would be introduced to the project area under the Alternative 1.

In-Street Segment. Under the Alternative 1, the existing night lighting along Beach Street would remain unchanged. Streetlamps illuminate the street, as well as lights emanating from nearby restaurants and stores. The historic radio tower also projects a light at night.

Transition Segment. The visual character of this area at night is very dark as there are no stores or restaurants at this end of Beach Street or Van Ness Avenue. The walking path that connects Beach Street to Van Ness Avenue along the western side of the Maritime Museum is illuminated by one streetlamp. The main feature of the night sky in this segment is the illuminated Ghirardelli sign, which is visible from the intersection of the foot path with Van Ness Avenue looking southwest.

Turnaround Segment. The Great Meadow is not lighted at night and is characterized by pervasive darkness since there are no structures within the park that project lights. The area of the proposed South Loop would be adjacent to Laguna Street, which is currently illuminated by three streetlamps on the east side of the street, and one streetlamp on the west side of the street along the segment between Bay Street and Marina Boulevard. The Safeway parking lot (across Laguna Street) is also illuminated at night, however there is little to no spillover into the Great Meadow.

The lower Fort Mason parking lot is illuminated by six streetlamps as well as lighting at the entry gate and along the gatehouse structure. All lamps appear to be low-wattage and downward cast.

Cumulative Impacts. Alternative 1 would have no direct or indirect impacts on night sky visibility. As a result, there would be no cumulative impacts under this alternative.

Conclusions. Alternative 1 would not result in any direct, indirect, impacts to night sky visibility.

4.10.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. The overhead contact system (OCS) is assumed to be a simple, single-wire system similar to the existing Muni OCS on the F-line trackage in the Fisherman's Wharf area on Jefferson, Jones and Beach Streets. The system assumed would be configured for trolley pole operation by historic streetcars. Poles would be spaced approximately every 100 feet on tangent track. On streets with only one track the OCS would normally be suspended from a mast arm attached to a pole on the sidewalk, (similar to current poles and mast arms on Jefferson and Beach Streets), incorporating decorative streetlights similar to those used for the F-line project (URS 2009e).

The track lights, if needed, would be attached to overhead poles at 100 feet maximum spacing. 1.1 to 2.0 foot candles are required for track lighting with 3:1 uniformity ratio for average to minimum and

5:1 for maximum to minimum for street/trackway. Five-foot candles are required for general boarding platform area (Wong 2010).

While the project would require additional lighting, the ability to use light shielding fixtures and the fact that facilities would be placed in an already light environment would not appreciably alter important landscape characteristics, and view intactness would change only slightly, so as to not negatively affect scenic quality, thus a long-term minor impact would be realized.

Cumulative Impacts. Cumulative effects to night sky visibility and light pollution are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect night sky visibility within the project area.

There are very few reasonably foreseeable projects that could contribute to light pollution. Projects that introduce a new structure that could be lit at night or incorporate outside lighting such as the 721 Beach Street Development and the Fisherman's Wharf Public Realm Plan could cumulatively contribute to the night sky light pollution. The adverse effects of these projects would be long-term in nature depending on the quantity of lights that are added.

Collectively, the cumulative projects discussed above would have a long-term, minor to moderate, adverse impact to night sky visibility within the project area.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would result in a long-term, minor to moderate, adverse cumulative impact on night sky visibility in the project area.

Mitigation Measures

NIGHT-1: The project would be required to minimize the use of lighting in areas already well lit and to use full cutoff light fixtures throughout the project.

Conclusions. Alternative 2 would have long-term minor impacts due to increased night lighting.

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4.11 GEOLOGY, SOILS AND SEISMICITY

4.11.1 Methodology and Assumptions

This section evaluates the project alternatives qualitatively in terms of their effect on soil and mineral resources, as well as the potential for damage to proposed structures or increased risk of injury due to geologic and seismic hazards. This evaluation is based upon existing studies and maps prepared by the United States Geological Survey (USGS) and California Geologic Survey (CGS), and a geotechnical report prepared by Kleinfelder Associates, a geotechnical engineering firm that evaluated the geology, stability and structural condition of the Fort Mason tunnel. In addition, the conclusions and recommendations provided in the tunnel geotechnical report are evaluated, and if appropriate, incorporated into the analysis of environmental consequences and mitigation measures.

The following issues, based on the NPS Management Policies, were considered in the analysis of impacts related to geology and soils for each alternative:

- Accelerated and/or environmentally harmful soil erosion;
- Damage to project elements or increased exposure of the public to risks from rupture of a known earthquake fault;
- Injury, death, or property damage as a result of earthquake induced ground deformations (e.g., lateral spreading, subsidence, liquefaction, or collapse), or otherwise unstable soils;
- Injury, death, or property damage as a result of an onsite or offsite landslide;
- Loss of or damage to known geologic, paleontological or mineral resources.

Based on the environmental setting of the study area and the features of the proposed project, there would be no adverse impact from either of the project alternatives for the two following issues:

- *Impacts from rupture of a known earthquake fault.* While there are distant regional faults capable of producing strong ground-shaking at the site, there are no active or potentially active faults that cross the project study area. Thus, ground rupture along an earthquake fault within the project area would not occur, and does not represent a hazard to the project study area.
- *Loss of or damage to known geologic, paleontological or mineral resources.* The project is located in an urban area where there are no significant mineral deposits present (see Section 3.11), and the grading to occur for the project alternatives would occur in soils with little to no potential to uncover paleontological resources. Dune sands and artificial fills are recently deposited material that have not formed over a period of time long enough to mineralize or preserve floral or faunal remains.

Thus, the above issues were determined to not be applicable to the proposed alternatives and are not discussed further. The following thresholds are used in determining the significance of impacts with respect to each of the other applicable issues:

Impact Intensity	Impact Description
Negligible:	Risks to the public and the environment from soil erosion and seismic or landslide events would remain unchanged, or the change in risk would be at such low levels of detection that it would not have a discernible effect on resources or public safety.
Minor:	The change in risks to the public and the environment from soil erosion and seismic or landslide events would be detectable but would not be appreciable.
Moderate:	The change in risks to the public and the environment from soil erosion and seismic or landslide events would be readily apparent and long-term, with substantial, noticeable changes in risks to the public and the environment locally within the study area.
Major:	The change in risks to the public and the environment from soil erosion and seismic or landslide events would be readily apparent, long-term, and would result in substantial, changes in risks to the public and the environment throughout the study area.

Short-term impacts are temporary in nature (and often associated with construction), whereas long-term impacts would have a continuing effect on the natural and human environment.

Beneficial impacts would reduce soil erosion and reduce risks to the public from seismic and landslide events, whereas adverse impacts would increase soil erosion and increase risks to the public from seismic and landslide events.

4.11.2 Impacts of Alternative 1 — No-Action Alternative

Impact Analysis. Under Alternative 1, the occurrence of or potential for soil erosion and seismic or landslide events would remain similar or the same as current conditions for all portions of the project study area except for the Fort Mason Tunnel Segment. Under the no-action alternative, the in-street, transition, and turnaround segments would result in negligible adverse impacts to geology and soils.

The western half of the tunnel, which was built using cut and cover methods, is within artificial fill that has not likely been properly engineered (see unit Qaf in Figure 3.11-3). Dynamic compaction of the fill materials during previous earthquakes may have contributed to a large longitudinal crack along the tunnel's crown (Kleinfelder 2005). It is estimated that a future design basis earthquake could cause as much of 8 inches of additional settlement in the artificial fills overlying the tunnel. This additional settlement could increase the vertical stresses on the tunnel walls, and would further compromise the structural stability of the tunnel.

For the Fort Mason Tunnel segment, repair measures would not be implemented and the structural condition of the tunnel could worsen over time. In the long-term, the tunnel could deteriorate further through continued inflow of water through construction joints and other cracks. This water infiltration has caused and may continue to cause spalling[1], efflorescence and degradation of concrete around the cracks. Further, future earthquakes could be substantial enough to cause dynamic

[1] Spalling occurs when flakes of a material break off a larger solid body and can be produced by a variety of mechanisms, including as a result of projectile impact, corrosion, weathering, cavitation, or excessive rolling pressure.

compaction of fill materials overlying the western segment of the tunnel (causing as much as 8 inches of settlement for a design-basis earthquake[2]), potentially worsening longitudinal cracks within the crown of the tunnel, or creating new cracks.

Under the no action alternative, the tunnel would remain closed to the public, thus preventing risks to the public within the tunnel itself. However, it is unknown whether, in its current condition, the tunnel would remain structurally stable during future earthquake scenarios. If the tunnel were to fail, the overlying fill material could cave, possibly resulting in offsite ground failure, such as landslide or collapse. This would present a substantial risk to the general public as well as a number of buildings within the Fort Mason complex that overlie the tunnel, several of which are historic structures. While the potential for this impact to occur is low, it is possible based on the available information and the current condition of the tunnel. For these reasons, the no action alternative represents a moderate, long-term, adverse impact with respect to the stability of the Fort Mason Tunnel segment.

The geotechnical report for the tunnel alignment recommended that numerical analyses be conducted to evaluate how the dynamic compaction of overlying fill materials during a design earthquake would affect the stability of the tunnel walls. This recommendation is presented as mitigation measure GEO-1. If numerical analyses indicate that the tunnel would remain stable under a design earthquake, repair measures would not be necessary, and the impact would be shown to be to minor. Should the analysis indicate that the tunnel would not be stable or would otherwise be prone to collapse; the NPS shall implement tunnel repair measures as described in mitigation measure GEO-3 in order to reduce this potential impact to minor levels.

Cumulative Impacts. The entire Bay Area lies within a seismically-active region with geologic, soil, and seismic conditions that vary substantially within short distances. The geographic scope for cumulative impacts from geologic and seismic hazards is very localized, and restricted to the rock unit, soil unit, or slope condition directly affected by the project. Thus, for cumulative impacts to occur, projects in the cumulative scenario would have to be located within or immediately adjacent to the no-action alternative. Because the no-action alternative would have negligible impacts with respect to geologic and seismic hazards there would be no cumulative impacts related to these issues as a result of this alternative. The one exception is the stability of the Fort Mason Tunnel, which represents a moderate, long-term, adverse impact of the no action alternative. However, none of the projects in the cumulative scenario (Section 4.1.2) would overlie or otherwise affect the potentially unstable portion of the tunnel.

The geographic scope for cumulative impacts from soil erosion includes the project study area and all downstream drainage areas. Because there would be no additional impacts with respect to soil erosion, there would be no cumulative impacts as a result of the no action alternative.

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[2] The design basis earthquake (DBE) represents an earthquake that has a 1 in 1000 chance of occurring in the next 50 years. The DBE determined by Kleinfelder (2005) for the Fort Mason Tunnel has a peak ground acceleration (PGA) of 0.674g (see chapter 3.11 for an explanation of PGA).

Mitigation Measures

GEO-1: As recommended in the geotechnical investigation for the Fort Mason Tunnel (Kleinfelder 2005), further analyses shall be conducted to determine whether or not the tunnel is vulnerable to additional damage due to compaction of soil during an earthquake. Further geotechnical study shall be conducted to evaluate the effect of additional strains caused by dynamic compaction of fill sand, and how these strains would be transferred to the tunnel liner. This analysis shall be conducted by a registered geotechnical engineer, and shall include an assessment of the risk for structural failure or collapse of the tunnel during a design earthquake, and possible ramifications for overlying property.

Conclusions. The no action alternative would result in negligible impacts with respect to soil erosion and seismic or landslide events for all segments of the alternative, except for the Fort Mason Tunnel Segment. The western portion of the tunnel, overlain by un-compacted fills, could experience a moderate, long-term, adverse impact from dynamic settlement caused by a design-basis earthquake. This moderate impact would be reduced to minor intensity with implementation of the proposed mitigation measure(s).

4.11.3 Impacts of Alternative 2 — Action Alternative (with Turnaround Options)

Impact Analysis for Construction. Preliminary stages of construction, including the excavation, grading and installation of new rail tracks, could leave loose soil exposed to the erosive forces of rainfall and high winds. Construction of tracks and rail along each block segment is anticipated to take three weeks on each side of the road, for a total of six weeks per block. This means that soils underlying the street pavement would not be exposed for long at any one time. The alignment for construction activities is generally at low grades and thus the potential for substantial surface water runoff and erosion is considered unlikely.

Because soil surface disturbance for the proposed project would be greater than one acre, specific erosion control measures would be identified as part of the National Pollutant Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP) required for construction. During construction, erosion control measures would be implemented that utilize Construction Water Quality Best Management Practices (BMPs) to avoid or minimize soil erosion and off-site sediment transport. Examples of typical construction BMPs include scheduling or limiting activities to certain times of the year; installing sediment barriers such as silt fence and fiber rolls along the perimeter of the construction area; maintaining equipment and vehicles used for construction; developing and implementing a spill prevention and cleanup plan. The SWPPP (and associated BMPs) would be prepared and implemented prior to commencing construction, and BMP effectiveness would be ensured through the sampling, monitoring, reporting, and record keeping requirements contained in the construction general permit. In addition, the general construction permit required under the NPDES program would require that the topsoil (if present) be preserved in areas requiring grading in order to ensure proper implementation of post-construction BMPs for site restoration.

For these reasons, construction of the action alternative would result in a minor, short-term, adverse impact related to soil erosion.

Because construction activities would be short-term, it is highly unlikely that a strong earthquake would occur during construction of the action alternative. Further, should an earthquake occur during construction of the action alternative, the ground-shaking effects would not threaten the public, because construction zones would be off-limits. Construction works would be inspected for damage and repaired, if needed. For these reasons, construction of the proposed project would result in a minor, short-term, adverse impact with respect to earthquake-induced ground deformation.

Generally the action alternative is located on flat ground that would not be prone to on or off-site landslides. For the in-street segment, portions of the transition segment, and the north loop options of the turnaround segment, the effect of landslides would be a negligible, short-term (and long-term) adverse effect of the project.

As discussed in Section 3.11, seismically-induced landslide zones have been mapped by CGS along the slopes adjacent to the east portal of the Fort Mason Tunnel Segment. However, the geotechnical study completed for the Fort Mason Tunnel determined that these areas, rather than being composed of slope debris and ravine fill, are actually composed of artificial fills from the historical development of Fort Mason (Kleinfelder 2005). The study analyzed the stability of this area under both normal conditions and during a design basis earthquake, and concluded that the area would be stable during construction. Construction of the action alternative would not require significant cuts into these slopes. For these reasons, seismically induced landslides in or adjacent to the eastern portal of the Fort Mason Tunnel are considered a negligible, short-term adverse impact of construction for the action alternative.

Two areas of concern for slope stability include the construction of the transition segment and the south loop option of the turnaround segment. In both these areas, significant cuts into the land surface would be required to accommodate the new railway alignment. For the transition segment, a retaining wall 5 to 10 feet high would be constructed south of the streetcar alignment within an area mapped as being composed of artificial fill. For the south loop option of the turnaround segment, another retaining wall 5 to 10 feet high would be constructed east of the streetcar alignment within the dune sands of the Fort Mason park area. Both these soil units are potentially unstable due to their lack of cohesion. Without proper controls, these cuts could undermine the base of slopes, potentially removing materials that support upland soils which could slough, slump or ravel if unsupported. For these reasons, the effect of landslides could result in a moderate, short-term adverse impact for the portions of the railway alignment requiring retaining walls.

Modern engineering standards of care, the California Building Code, and CalOSHA requirements contain provisions that sufficiently address these potential hazards of construction. These include standard practices such as the following: minimizing the amount of grading required; installing adequate drainage of improved areas; bracing, underpinning, or other methods of temporary support; and slope armoring or revegetation. However, to ensure the safety and stability of upland slopes during construction, mitigation measure GEO-2 shall be implemented, which would reduce the potential for landslides to a minor, short-term adverse impact.

Impact Analysis for Operation. Operation and maintenance of the action alternative would have a negligible, long-term adverse impact on soil erosion. This is because all areas of soil exposed due to

excavation and grading during construction would be repaved, revegetated or landscaped according to the requirements of the legally-required SWPPP (described above) and the design of the action alternative, which includes landscaping. These measures would result in negligible changes to soil erosion occurring under existing conditions.

Throughout the project area there is potential for strong seismic ground shaking in the event of a regionally-significant earthquake. A peak ground acceleration of 0.59g has a 10 percent chance of occurring in the next fifty years at the site. This PGA value means that in an unlikely event, ground shaking could reach very strong levels, capable of causing considerable damage in older buildings not built to modern building codes, and also capable of inducing liquefaction in susceptible soils. Subsurface soils of the in-street segment, the transition segment and part of the turnaround segment may be prone to liquefaction as discussed in the setting (Figure 3.11-2). In these areas, there is a potential for permanent ground displacement due to the historic occurrence of liquefaction, and local geological, geotechnical and groundwater conditions. Within dune sands along the tunnel segment, however, a review of historic liquefaction effects indicated a low susceptibility to liquefaction due to deep groundwater and dense nature of dune sands (Kleinfelder 2005).

The western half of the tunnel, which was built using cut and cover methods, is within artificial fill that has not likely been properly engineered (see unit Qaf in Figure 3.11-3). Dynamic compaction of the fill materials during previous earthquakes may have contributed to a large longitudinal crack along the tunnel's crown (Kleinfelder 2005). It is estimated that a future design basis earthquake could cause as much of 8 inches of additional settlement in the artificial fills overlying the tunnel. This additional settlement could increase the vertical stresses on the tunnel walls, and would further compromise the structural stability of the tunnel.

Several laws and policies impose stringent seismic safety requirements on the design and construction of new structures. All buildings in California are subject to the standards in the California Building Code (CBC), which requires engineers to develop seismic design criteria that reflect the nature and magnitude of maximum ground motions that can be reasonably expected. These seismic design criteria allow engineers to apply appropriate building codes and design structures to withstand the effects of earthquakes. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. Standard construction practices and adherence to the provisions of the CBC or other applicable building standards would ensure that operation and maintenance of the streetcar would not substantially increase risks to the public from strong ground shaking and related effects.

Operation of the streetcar through the tunnel segment would substantially increase risks without proper repair and improvements. The condition of the tunnel is not up to modern building standards, and has serious structural flaws (see Section 3.11). A geotechnical investigation has been conducted to characterize the condition of and seismic risks to the Fort Mason Tunnel segment and its recommendations shall be implemented as described in mitigation measure GEO-3. Proper repair and stabilization of the tunnel would ensure that the risk to the public from an earthquake, and earthquake induced settlement on the western half of the tunnel would be minor.

The majority of the project alignment is on flat ground that would not be susceptible to future landslides. The geotechnical characterization of the Fort Mason Tunnel concluded that the slopes adjacent to the eastern portal would remain stable under both normal conditions and during an earthquake (Kleinfelder 2005). Proper characterization and installation of the planned retaining walls along the transition segment and the south loop option of the turnaround segment, as described in mitigation measure GEO-2, would ensure that operation and maintenance of the proposed project would not be threatened by an on or offsite landslide. For these reasons the potential impact due to landslides would be minor.

Alternative 2A: North Loop Option. Construction and operation of the North Loop Option would require minor grading, concrete removal, excavation, utility work, and installation of project improvements. The environmental impacts would be similar or the same as those discussed above. One advantage of the north loop option from a geotechnical standpoint is that it would require much less grading and excavation than the south loop option. The north loop option would not require a retaining wall and would thus have fewer slope stability concerns. Implementation of mitigation measure GEO-3 would ensure that the north wing wall of the tunnel adjacent to the north loop option be anchored with tie backs to ensure the wall remains stable during an earthquake. In addition, the north loop option would result in no net increase in impervious surfaces, as the area is already paved, thus preventing any increases in the amount of stormwater runoff received by the city's storm drain system.

Alternative 2B: South Loop Option. Construction and operation of the South Loop Option would require substantial grading, concrete removal, excavation, utility work, and installation of project improvements. The environmental impacts would be similar or the same as those discussed above. The south loop option has several disadvantages from the north loop option from a geotechnical standpoint. Installation of the South Loop Option would require grading the hillside within Fort Mason park area and installing a retaining wall. Mitigation measure GEO-2 would be needed to ensure proper installation of the retaining wall. Further, the South Loop Option would result in a net increase in the amount of impervious surfaces in the project area, because it would pave a substantial area that is currently vegetated. This could result in a minor increase in the amount of stormwater delivered to nearby storm drains.

Cumulative Impacts. Cumulative effects to geology are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The Bay Area is a seismically-active region with highly localized geological and soil conditions. Thus the cumulative context for potential impacts to people and structures related to geologic and seismic hazards tends to be site-specific.

The following projects are reasonably foreseeable structural projects: San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Doyle Drive. Implementation of the Alternative 2 combined with other past, ongoing or foreseeable developments in the area could expose the public to seismic and geological hazards resulting in a minor to moderate adverse impact. However each of these projects, and planned future projects on adjacent sites, would be required to adhere to all

applicable building codes and ordinances as well as all federal, state, and local programs, requirements and policies pertaining to building safety and construction permitting. Therefore, the project's incremental contribution to any cumulative impact from exposing people or structures to geologic hazards, soils, and/or seismic conditions would not be cumulatively considerable.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a long-term, minor to moderate, adverse cumulative impact on geology in the project area.

Mitigation Measures

GEO-2: A California licensed geotechnical engineer or engineering geologist shall conduct a slope stability evaluation for all areas where retaining walls would be installed, such as the area south of the Transition Segment, and east of the south loop option of the Turnaround Segment. Prior to the final design, the geotechnical engineer or engineering geologist shall prepare recommendations applicable to structural design, earthwork, backfill and site preparation prior to or during the project design phase. The recommendations of the geotechnical engineer or engineering geologist shall be incorporated into the design and construction specifications and shall be implemented by the construction contractor. The construction manager would conduct inspections and certify that all design criteria have been met in accordance with the most recent version of the California Building Code.

GEO-3: The Fort Mason Tunnel shall be rehabilitated according to the recommendations of the geotechnical assessment performed by Kleinfelder (2005). The tunnel improvements shall include sealing existing cracks with polyurethane grout; providing drainage paths for groundwater via weep holes in the tunnel sidewalls and invert; backfilling voids behind the tunnel lining; cleaning and roughening the existing lining to ensure adequate bond; and adding new tunnel lining composed of steel-reinforced, cast-in-place concrete or "shotcrete," which shall vary from 6 to 16 inches in thickness depending on location within the tunnel. In addition, to ensure the stability of the north wing/retaining wall for the western portal during an earthquake, tie-back anchors shall be installed.

Conclusions. Generally, the action alternative would result in minor effects with respect to soil erosion and seismic or landslide events. The installation and operation of a street car, with adherence to modern building codes and the CBC, would not substantially increase risks to the public from seismic or geologic hazards. The streetcar line would be built on low grades and thus risks from landslides or slope stability are generally minor. The one exception is that the Fort Mason Tunnel would be opened and used as a public transit tunnel, thereby potentially increasing risks from structural instability. Implementation of the geotechnical recommendations contained in mitigation measure GEO-3 would repair the tunnel and ensure proper performance during an earthquake.

4.12 BIOLOGICAL RESOURCES

4.12.1 Methodology and Assumptions

The alternatives are evaluated qualitatively in terms of their effect on biological resources, including vegetation communities, wildlife, and special-status species. Potential effects on these resources are assessed based on:

- The project description and project plans.
- Recent (2010) CDFG, USFWS, and CNPS lists for special-status species with potential to occur in the study area, and a map of CDFG records in the vicinity of the Project Area.
- Two reconnaissance field surveys, conducted in the Project Area in 2006 (by URS biologist M. Newman) and 2010 (by ESA biologist D. Ostfeld), to identify vegetation and habitat types.

Vegetation. Available information on vegetation (including trees[1]) was compiled and data related to vegetative communities potentially impacted at the project site was reviewed. Predictions about short- and long-term site impacts were based on previous projects with similar vegetation and recent studies. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Impact Description
Negligible:	No effects would occur, or effects would result in no measurable or perceptible changes in plant community size, continuity, or integrity.
Minor:	Effects would be measurable, but localized and within a relatively small area, and the overall viability of the plant community would not be affected. These impacts can be mitigated relatively easily through avoidance/minimization measures, revegetation of the impacted area, or replacing the impacted vegetation nearby.
Moderate:	Effects to vegetation or a vegetation community would be measurable and perceptible over a larger area and could affect its overall amount and integrity in the study area. Impacts could be mitigated by implementation of impact avoidance/minimization measures, restoration of the vegetation community, or restoration of a previously lost or degraded vegetation community.
Major:	Effects would permanently, drastically alter the size or integrity of a vegetation community. Impacts to the vegetation community would not be fully mitigable.

Duration	
Short-term	Recovers in less than three growing seasons.
Long-term	Takes more than three growing seasons to recover.

[1] Although species using trees are analyzed for impact, the trees themselves are more properly considered a cultural resource and are evaluated in that section.

Wildlife. According to National Park Service *Management Policies 2006*, the restoration of native species is a high priority. Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals. While Fort Mason and the San Francisco Maritime National Historic Park are not known for their biological diversity, the remaining open spaces are nevertheless an important component to these parks.

Impact Intensity	Impact Description
Negligible:	No measureable or perceptible changes would occur to the amount, distribution, connectivity, or integrity of wildlife habitat or populations.
Minor:	Impacts may affect wildlife habitat, but impacts would be relatively small in scale. Impacts to wildlife such as temporary disturbance or the loss of an individual of a common species would be detectable, but these disturbances would not be expected to be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate:	Effects to wildlife habitat would be measurable and perceptible over a larger area and could affect its overall amount, integrity, and connectivity in the study area. Habitat changes and disturbance and loss of individuals could affect the overall size of wildlife populations, but reductions in population size would not threaten the continued existence of a species' local population. Impacts could be mitigated by implementation of impact avoidance/minimization measures, restoration of the vegetation community or habitat, restoration of previously lost or degraded wildlife habitat, or creation of new wildlife habitat.
Major:	Effects would permanently, drastically alter the amount, integrity, or connectivity of wildlife habitat. Changes in the size and integrity of a wildlife population could threaten the continued existence of a species' local population. Impacts to the wildlife habitat and associated populations could not be mitigated.

Duration	
Short-term	Habitat or wildlife species population is temporarily disturbed, such as during a portion of the construction activities.
Long-term	Habitat or wildlife species population takes more than one year to recover, if they recover at all.

Special-status Species. The Endangered Species Act (16 USC 1531 et seq.) mandates that federal agencies must consider the potential effects of their actions on species listed as threatened or endangered. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. National Park Service *Management Policies 2006* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend. Information on possible threatened, endangered, candidate species and species of special concern was gathered

from the National Park Service and U.S. Fish and Wildlife Service. The thresholds of change for the intensity of an impact are defined as follows:

Impact Intensity	Impact Description
Negligible:	No measureable or perceptible changes would occur to the amount, distribution, connectivity, or integrity of special-status wildlife habitat or populations.
Minor:	Impacts may affect some individual plants and a portion of the vegetation community as a whole, but impacts would be relatively small in scale. Impacts to special-status wildlife would be detectable, but they would not be expected to be outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them. No loss of special-status species individuals would be expected to occur. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
Moderate:	Effects to habitat for special-status wildlife would be measurable and perceptible over a larger area and could affect its overall amount, integrity, and connectivity in the study area. Habitat changes and disturbance and loss of individuals could affect the overall size of wildlife populations, but reductions in population size would not threaten the continued existence of a species' local population. Impacts could be mitigated by implementation of impact avoidance/minimization measures, restoration of the habitat, restoration of previously lost or degraded habitat, or creation of new wildlife habitat.
Major:	Effects would permanently, drastically alter the amount, integrity, or connectivity of habitat for special-status species. Changes in the size and integrity of a wildlife population could threaten the continued existence of a species' local population. Impacts to the wildlife habitat and associated populations could not be mitigated.

Duration	
Short-term	Habitat or wildlife species population is temporarily disturbed, such as during a portion of the construction activities.
Long-term	Habitat or wildlife species population is permanently disturbed or lost.

The historic streetcar alignment alternatives are described in Chapter 2, and include: (1) Alternative 1 – No Action; and (2) Alternative 2 – Action Alternative, including the north loop option and south loop option. The potential biological impacts under each of these alternatives are described below.

4.12.2 Impacts of Alternative 1—No-Action Alternative

Vegetation. There would be no tree or vegetation removal under the Alternative 1; therefore there would be negligible or no impact.

Wildlife. There would be no impacts to wildlife under Alternative 1.

Special-status Species. There would be no impacts to special-status species under Alternative 1.

Cumulative Impacts. Alternative 1 would have no direct or indirect impacts on biological resources. As a result, there would be no cumulative impacts under this alternative.

Conclusions. The No Action alternative would result in no measurable change to vegetation, wildlife, or special-status species.

4.12.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Alternative 2A: North Loop Option

Vegetation. As part of the North Loop option, approximately 400 linear feet of new track and two platforms would replace existing cultivated vegetation (non-native grasses and between 1 and 5 trees) on the east side of the Fort Mason tunnel. If it is determined that the bocce court is to be relocated, then it would be relocated in an area that is predominantly paved. These areas are largely maintained as an urban park, with special attention given to preserving the historic character of these areas.

Additional vegetation could be temporarily disturbed through potential access roads and staging areas, although none have been identified at this time. If these areas are not revegetated, then they can be taken over by exotic and weedy species such as French broom and pampas grass.

None of the vegetation that would be impacted from project construction is native, and any cultural significance that this vegetation might have for Fort Mason and the San Francisco Maritime National Historic Park is addressed in Section 4.8 Cultural Resources.

The overall biological impact of removing non-native grasses and trees would be long-term, minor, and beneficial because this vegetation is not native. Operation of the proposed streetcar would not result in any greater significant loss to this vegetation.

Wildlife. Most of the streetcar alignment would be constructed in a paved street, which provides little existing habitat for wildlife. However, urban wildlife species such as raccoons, skunks, Brewer's blackbirds, and song sparrows may forage or travel through the area. In addition, squirrels and birds may nest or forage in undeveloped portions of the study area such as in the Great Meadow, near the bocce ball court, and in Victorian Park. The construction of the streetcar alignment could result in short-term, minor, adverse effects to common wildlife if increased noise causes wildlife to travel and forage elsewhere. Alternatively, earthwork and disturbance to groundcover may expose seeds, insects, and mammals (e.g., Botta's pocket gopher) which could also result in short-term, minor, beneficial effects to nearby wildlife.

Streetcar operations are unlikely to adversely affect wildlife in the area. However there is a small chance that the streetcar operations would result in injury/mortality of wildlife (e.g., raccoons, opossums, and birds) that are hit by moving streetcars. Impacts as a result of the project compared to existing conditions would be negligible.

Special-status Species. Special-status bats such as the Townsend's big-eared bat could roost within the Fort Mason tunnel. Special-status bats such as the hoary bat and western red bat could also roost individually in eucalyptus or cottonwood trees in the project area. However, special-status bats are unlikely to occur because there is limited foraging habitat in the study area and a limited number of trees in the project area for habitat. Furthermore, no bats have been identified roosting in the study area, and

there is no sign of active bat roosts (e.g., guano, or urine staining) in the tunnel or trees proposed for removal.

Proposed reconstruction of the Fort Mason Tunnel interior and renewed operations of streetcars in the tunnel could result in temporary or permanent displacement of bats within the tunnel, and thus have short-term or long-term moderately adverse affects on special-status bats, if present. Alternatively, reconstruction of the tunnel interior could result in long-term, moderately beneficial impacts on special-status bats, if the tunnel modifications include measures such as reduced air-flow through the tunnel or creation of small crevices in the tunnel for crevice-roosting bats. Streetcar operations could result in long-term, moderate, adverse affects on special-status roosting bats in the Fort Mason tunnel, if bats are currently present in the tunnel but streetcar operations in the tunnel make it unsuitable for roosting.

Special-status birds could nest in trees or buildings within or near the historic streetcar alignment. If present, it is assumed that these birds are fairly tolerant to noise disturbance, given the urban nature of the project site, with high visitor use and large roads nearby (e.g., Laguna Street, Van Ness Avenue, Beach Street, and Jefferson Street). Nevertheless, loud construction noise could stress nearby nesting birds and result in nest failure or abandonment, or the bird's nesting habitat (e.g., shrubs or trees) could be removed as part of ground clearance for the project. Thus, proposed project construction could result in short-term, moderately adverse impacts on nesting birds during construction. Black-crowned Night-herons, whose rookeries are mentioned as a resource in the California Special Animals List, regularly roost in trees at the foot of Van Ness in the project area. This long-term roosting site would likely be disturbed by the project. However, there are other sites available nearby for roosting and nesting populations would not be affected.

Operation of the streetcar would likely result in negligible impacts on special-status birds in the study area.

Alternative 2B: South Loop Option

Vegetation. As part of the South Loop option, approximately 400 linear feet of new tracks and two platforms would replace existing cultivated vegetation (non-native grasses and trees) on the east side of the Fort Mason tunnel. The bocce court would be relocated in an area that is predominantly paved, but that also contains a small amount of cultivated vegetation, including non-native palm trees. In addition, construction of the South Loop, a retaining wall, and a platform would result in the loss of trees and landscaped grassland at the west end of the Great Meadow. These areas are maintained as an urban park, with special attention given to preserving the historic character but not their natural habitat.

Additional vegetation could be temporarily disturbed through potential access roads and staging areas, although none have been identified at this time. If disturbed areas are not revegetated, then they can be taken over by exotic and weedy species such as French broom and pampas grass.

None of the vegetation that would be impacted by project construction is native vegetation, and any cultural significance that this vegetation might have for Fort Mason and the San Francisco Maritime National Historic Park is addressed in Section 4.8 Cultural Resources.

The overall biological impact of removing non-native grasses and trees would be long-term, minor, and beneficial because although the vegetation cover would be lost, this vegetation is not native.

Operation of the proposed streetcar would not result in any greater significant loss to this vegetation.

Wildlife. Most of the streetcar alignment would be in a paved street, which provides little habitat for wildlife. However, urban wildlife species may forage and travel through the area, such as striped skunk (*Mephitis mephitis*), Brewer's blackbird (*Euphagus cyanocephalus*), and song sparrow (*Melospiza melodia*). In addition, squirrels and birds may nest/forage in undeveloped portions of the study area such as in the Great Meadow, near the bocce ball court, and in Victorian Park. The construction of the streetcar alignment could result in short-term, minor, adverse effects to common wildlife if increased noise causes wildlife to travel and forage elsewhere. Alternatively, digging up groundcover and exposing seeds, insects, and mammals (e.g., Botta's pocket gopher [*Thomomys bottae*]), could also result in short-term, minor, beneficial effects to nearby wildlife.

While there is a small chance that common wildlife (e.g., raccoons, opossums, and birds) could be injured or killed from moving streetcars, the overall project impacts compared to existing conditions would be negligible.

Special-status Species. Special-status bats such as the Townsend's big-eared bat could roost within the Fort Mason tunnel. Special-status bats such as the hoary bat and western red bat could roost individually in eucalyptus trees or cottonwood in the project area. However, special-status bats are unlikely to occur because there is limited foraging habitat in the study area and a limited number of trees in the project area. Furthermore, no bats have been identified roosting in the study area, and there is no sign of bat roosts (e.g., guano, or urine staining) in the tunnel or trees that are proposed for removal.

Proposed reconstruction of the Fort Mason Tunnel interior and renewed operations of streetcars in the tunnel could result in temporary or permanent displacement of bats in the tunnel, and thus have short-term or long-term moderately adverse affects on special-status bats, if present. Alternatively, reconstruction of the tunnel interior could result in long-term, moderately beneficial impacts on special-status bats, if the tunnel modifications include measures such as reduced air-flow through the tunnel or creation of small crevices in the tunnel for crevice-roosting bats. The removal of trees during construction could also have short-term, minor, adverse effects on bats.

Streetcar operations could result in long-term, moderate, adverse affects on special-status roosting bats in the Fort Mason tunnel, if bats are currently present in the tunnel but streetcar operations in the tunnel make it unsuitable for roosting.

Special-status birds could nest in trees or buildings within or near the historic streetcar alignment. If present, it is assumed that these birds are fairly tolerant to noise disturbance, given the urban nature of the project site, with high visitor use and large roads nearby (e.g., Laguna Street, Van Ness Avenue, Beach Street, and Jefferson Street). Nevertheless, loud construction noise could stress nearby nesting birds and result in nest failure or abandonment, or the bird's nesting habitat (e.g., shrubs or trees) could be removed as part of ground clearance for the project. Thus, proposed project construction could result in short-term, moderately adverse impacts on nesting birds during construction. Black-

crowned night-herons, whose rookeries are mentioned as a resource in the California Special Animals List, regularly roost in trees at the foot of Van Ness Avenue in the project area. This long-term roosting site would likely be disturbed by the project. However, there are other sites available nearby for roosting and nesting populations would not be affected. Operation of the streetcar would likely result in negligible impacts on special-status birds in the study area.

Cumulative Impacts. Cumulative effects to biological resources are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. Past actions in the study area have resulted in the almost complete removal of vegetation native to California (except for native vegetation at Black Point, and perhaps a few other small pockets of native vegetation), the alteration of the Bay coastline, and the removal of suitable habitat for special-status species. Present and future actions include transportation systems improvements (e.g., present actions include the Third Street Light Rail Project, and the Presidio Transit Program; and future actions include the Van Ness Bus Rapid Transit, the E-Embarcadero Historic Streetcar Line, and the Doyle Drive Replacement Project) and some restoration of historic buildings and piers as well as site improvements to Fort Mason for safety and accessibility. These present and future projects would have negligible to minor adverse impacts on biological resources in the area, as they would predominantly impact already developed streets and buildings. Because this alternative would have a relatively small impact on any remaining biological resources in the project area, there would be an overall long-term negligible impact on biological resources when Alternative 2 is cumulatively combined with other past, present, and future projects in the area.

Mitigation Measures

Vegetation. No mitigation would be needed for impacts to cultivated vegetation (grass and non-native trees), because cultivated vegetation is common locally and regionally, is not protected by state or federal law, and impacts are expected to be minor. Any adverse effects potentially resulting from the introduction and spread of invasive weeds throughout the study area as a result of construction would be minor, and federal agencies are mandated by Executive Order 13112 ("Invasive Species") and other federal laws to prevent the spread of invasive species, so no additional mitigation would be needed.

Wildlife. The following measures to avoid and minimize potential effects to nesting birds shall be implemented as mitigation for project impacts.

> **BIO-1:** Preconstruction Nesting Bird Surveys. Tree removal shall occur outside of the nesting bird season (January 15 through August 15) to the greatest extent possible. If not possible, then a qualified biologist shall conduct nesting bird surveys in the trees to be removed and surrounding 300 feet. If nesting raptors or other native nesting birds are detected, then a qualified biologist shall delineate a suitable no-disturbance buffer, and construction activities shall avoid this buffer until the young birds have fledged or active nests have been abandoned.
>
> **BIO-2:** Preconstruction Roosting Bat Surveys. A qualified bat biologist shall survey the Fort Mason Tunnel itself and any trees proposed for removal, prior to reconstruction of the tunnel and tree removal activities. If it is determined that the tunnel or trees provide roosting habitat for special-status bats, then a qualified bat biologist shall develop measures to avoid and minimize adverse effects to the bats to the greatest extent feasible. Such measures may include seasonal avoidance of a bat roost, and/or including bat-friendly habitat characteristics into the tunnel

reconstruction design (e.g., crevices for crevice-roosting bats, or open spaces for Townsend's big-eared bats to cluster).

Conclusions. After implementation of the mitigation measures BIO-1 and BIO-2, construction and operation impacts would have negligible impacts on biological resources, and the overall vegetation and wildlife habitat in the study area would remain the same. Overall long-term cumulative impacts on biological resources would be negligible to minor adverse.

4.13 PUBLIC HEALTH AND SAFETY

4.13.1 Methodology and Assumptions

This section discusses the potential for construction and operation of the proposed streetcar line to affect public health and safety and evaluates to what degree, and for what duration, these projected changes would occur. Because the construction of the proposed streetcar alternatives would require grading and possible soil excavation, this analysis addresses the potential to encounter hazardous materials in the subsurface. Database searches conducted using information from California Department of Toxic Substances Control, California Water Resources Control Board, and Environmental Data Resources (EDR) were used to identify potential hazardous materials sites within a mile radius of the Project alignment. The sites were then evaluated, based on the nature of the hazard and distance from the Project alignment, to assess whether soil and groundwater contamination could be encountered during Project construction or operation. In addition, the potential hazards to the public and the environment were assessed based on proposed construction and operating activities. Potential risk to public health and safety resulting from geologic and seismic hazards are discussed in Section 4.11, Geology, Soils and Seismicity.

The following issues were considered in the analysis of impacts related to public health and safety for each alternative:

- Transport, use or disposal of hazardous materials;
- Reasonably foreseeable upset and accident involving the release of hazardous materials into the environment;
- Emission or release of hazardous materials in proximity to sensitive receptors; or
- Location on or near a hazardous materials site as listed by Federal or State regulatory agencies.

The following thresholds are used in determining the significance of impacts with respect to each of the above issues:

Impact Intensity	Impact Description
Negligible:	Alternative would result in no discernable changes in level of public health and safety.
Minor:	Alternative would result in changes in the conditions of public health and safety, although the changes would be slight. The public may or may not be aware of the effects associated with the alternative. This may include release or clean-up of small quantities of hazardous materials. It may also include slightly increased or decreased exposure of the public to existing hazards.
Moderate:	Alternative would result in distinct changes in the health and safety of the public. Changes would be readily apparent. The impacts could have an appreciable health and safety effect. This may include releases or clean-up of moderate quantities of hazardous materials. It may also include noticeably heightened or diminished risk of exposure to existing hazards.
Major:	Alternative would result in substantial changes in the conditions of public health and safety. Impact would be apparent and could have a severe health and safety impact. This may include releases or remediation of large quantities of hazardous materials. It may also include substantially increased or decreased exposure to existing hazards.

4.13.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. Under Alternative 1, the conditions of public health and safety in the project area would be similar to current conditions. This Alternative does not propose any construction activity or changes to the existing street car alignment. There would be no transport, use or disposal of hazardous materials for construction or operation. In addition, there would not be any grading or excavation that could forseeably result in the release of hazardous materials that may be present in the subsurface. While there are several hazardous materials sites listed by regulatory databases in the project area, the No-Action Alternative would not affect on-going investigations and cleanups at these sites or cause exposure to hazardous materials. The deteriorated condition of the Fort Mason Tunnel poses a public safety concern under this Alternative. These concerns are analyzed in Section 4.11 Geology, Soils and Seismicity.

Cumulative Impacts. No additional cumulative impacts would occur under Alternative 1.

Conclusions. Alternative 1 would not result in any direct or indirect impacts.

4.13.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Hazardous Materials Sites. Project construction activities may involve grading and excavation to install streetcar tracks and turnaround. If hazardous materials were present in excavated soil or groundwater, construction workers and the public could be exposed to hazardous materials or a release to the environment could occur. The greatest potential for encountering contaminated soil and groundwater during Project construction would be in areas where past or current land uses on or near the Project alignment may have resulted in leaking fuel or chemical storage tanks or other releases of hazardous materials. Properties with known soil and/or groundwater contamination are referred to as "environmental cases." As discussed in Section 3.13, a regulatory database review was performed to identify environmental cases in the Project area with the potential to affect soil or groundwater conditions along the Project alignment. There are eleven identified environmental cases along the proposed Project alignment (see Table 3.13-2) and seven environmental cases within approximately one quarter-mile of the Project alignment (see Table 3.13-3). Most of these cases are considered to have a low potential to affect subsurface conditions along the Project alignment based on the status of the environmental case or its proximity to the alignment. Only those environmental cases considered to present a moderate or high potential of creating subsurface contamination at the Project site are discussed below.

The Gashouse Cove facility is considered to have a moderate potential to affect site conditions because of a leaking underground storage tank (LUST) that is still under investigation. Two environmental cases within the Fort Mason area itself are considered to have a high potential for release of hazardous materials into the subsurface. These cases are known as U.S. Department of Interior Golden Gate National Recreation Area and the former Fort Mason military site. Further information regarding cleanup investigations at Fort Mason is discussed below specifically for the North Loop and South Loop areas.

Storage, Use and Transport of Hazardous Materials. Construction and operation of the Project could involve storage, use and transportation of hazardous materials. Construction activities would require the use of certain hazardous materials such as fuels, oils, solvents, and glues. Accidental release of hazardous materials used could degrade soil and groundwater quality, surface water quality in downstream water bodies, or expose construction workers and the public to the harmful effects of these materials.

Sensitive Receptors. Sensitive receptors include schools, hospitals, daycares and nursing homes as these populations are considered to be more sensitive to hazardous materials exposure. There are no hospitals located within a quarter mile of the Project site. One nursing home, The Heritage, is located within a quarter mile of the Project site at 3400 Laguna Street. One preschool, Marina Children's Center, is located at 3219 Laguna Street. There are four schools located approximately a quarter mile from the Project site. These schools include the following: Francisco Middle School, 2190 Powell Street; Marina Middle School, 3500 Fillmore Street; Galileo Academy, 1150 Francisco Street, and Hergl School; 1570 Greenwich Street.

Alternative 2A: North Loop Option. As discussed above, hazardous materials could be encountered in soil and groundwater along the Project alignment during construction of Alternative 2. If these hazardous materials are not properly handled and disposed, a risk to human and environmental health may result. As shown in Table 3.13-2, there are three potential areas of contamination in the vicinity of the North Loop Option, according to the U.S. Army Corps of Engineers' Final Site Investigation Work Plan for Fort Mason (USACE 2009). These areas of concern include: four diesel tanks (D-10 through D-13); a gas station, and a transformer vault. Because this site investigation has not yet been conducted, the potential presence of contamination at these locations of concern is currently unknown. The results of this investigation should be reviewed prior to construction in order to further evaluate hazardous materials concerns. Exposure to or release of hazardous materials in soil and groundwater during construction would be a moderate, short-term adverse impact. Implementation of mitigation measures HEA-1 through HEA-3, would reduce this effect by requiring a pre-construction hazardous materials assessment to evaluate the presence and extent of contamination; a soil and groundwater management plan in the event hazardous materials are encountered; and a Project-specific Health and Safety Plan to ensure worker safety when handling hazardous materials.

Construction of the North Loop Option would involve storage, use and transportation of hazardous materials such as fuels, oils, solvents, and glues. Potential impacts associated with the use and potential inadvertent releases of hazardous materials used for construction activities would be considered a moderate, short-term, adverse impact. This impact would be reduced to less than significant with implementation of mitigation measure HEA-2 and HEA-3, which require that the project sponsor develop a site specific health and safety plan as well as implement Best Management Practices (BMPs) for the use, storage, and disposal of hazardous materials and petroleum products.

The North Loop Option is located just over a quarter mile from several sensitive receptors. As discussed above, Project construction could result in inadvertent spills of hazardous materials. Release of small quantities of hazardous materials during construction would not result in an emission with the potential to result in harmful exposures to individuals at nearby sensitive receptors. Standard construction BMPs, as well as those required under mitigation measure HEA-2, include measures for the safe handling and

storage of hazardous materials to prevent a release as well as methods to contain any such release if it should occur. This would be considered a minor, short-term, adverse impact.

Operation of the North Loop Option would not result in exposures to hazardous materials potentially present in the subsurface. All streetcar maintenance would occur at the Muni yard, not along the alignment. Because the Project would not require the transport, use and disposal of hazardous materials, there would be no would be no increased risk of accidental release of hazardous materials into the environment or near sensitive receptors.

Alternative 2B: South Loop Option. As shown in Table 3.13-2, there are three potential areas of contamination in the vicinity of the proposed South Loop Option, according to the U.S. Army Corps of Engineers' Final Site Investigation Work Plan for Fort Mason. These areas of concern include: a transformer vault; the PX Service Station; and the Boiler House. Because this site investigation has not yet been conducted, the potential presence of contamination at these locations of concern is currently unknown. The results of this investigation should be reviewed prior to construction in order to evaluate hazardous materials concerns. Exposure to or release of hazardous materials in soil and groundwater during construction would be a moderate, short-term adverse impact. Implementation of mitigation measures HEA-1 through HEA-3, would reduce this effect by requiring a pre-construction hazardous materials assessment to evaluate the presence and extent of contamination; a soil and groundwater management plan in the event hazardous materials are encountered; and a project-specific Health and Safety Plan to ensure worker safety when handling hazardous materials.

As above, construction of the South Loop Option would involve storage, use and transportation of hazardous materials such as fuels, oils, solvents, and glues. Potential impacts associated with the use and potential inadvertent releases of hazardous materials used for construction activities would be considered a moderate, short-term, adverse impact. This impact would be reduced to less than significant with implementation of mitigation measures HEA-2 and HEA-3, which require that the project sponsor develop a site specific health and safety plan as well as implement Best Management Practices (BMPs) for the use, storage, and disposal of hazardous materials and petroleum products and other fuels and chemicals.

The South Loop Option is also located just over a quarter mile from several sensitive receptors. As discussed above, Project construction could result in inadvertent spills of hazardous materials. Release of small quantities of hazardous materials during construction would not result in an emission with the potential to result in harmful exposures to individuals at nearby sensitive receptors. Standard construction BMPs include measures for the safe handling and storage of hazardous materials to prevent a release ands well as methods to contain any such release if it should occur. This would be considered a minor, short-term, adverse impact.

Operation of the North Loop Option would not result in exposures to hazardous materials potentially present in the subsurface. In addition, it would not require the transport, use and disposal of hazardous materials so there would be no would be no increased risk of accidental release of hazardous materials into the environment or near sensitive receptors.

Cumulative Impacts. Cumulative effects to public health and safety are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this

alternative. The projects identified include only those projects that could affect exposure to hazardous materials and public health and safety within the project area.

Past, present, and reasonably foreseeable projects that could have a long-term beneficial effect on public health and safety include the Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Fort Mason Cultural Landscape, Fort Mason Sidewalk Replacement, Fort Mason Hazard Tree Replacement, upper Fort Mason Entry at Bay and Franklin Streets, Removal of Accessibility Barriers in upper Fort Mason. The beneficial impacts would result from improving safety and accessibility of features within the project study area. Therefore, the above-cited projects would result in a long-term, minor to moderate, beneficial impact to public health and safety within the project area.

Construction of some of the reasonably foreseeable projects, such as the San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Pier 2 shed restoration, Maritime Heritage Learning Center, and Doyle Drive are for the most part improvements to existing facilities in the long-term but could result in short-term adverse impacts to public health and safety during construction. The foreseeable development within the area, although likely increasing the potential to disturb existing contamination and the handling of hazardous materials, would be required to comply with the same regulatory framework as the Project. This includes federal and state regulatory requirements for transporting (Cal EPA and Caltrans) hazardous materials or cargo (including fuel and other materials used in all motor vehicles) on public roads or disposing of hazardous materials.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a local, short-term, minor, adverse cumulative impact on public health and safety in the project area.

Mitigation Measures

HEA-1: Pre-Construction Hazardous Materials Assessment. Within six months prior to construction, NPS shall retain a qualified environmental professional to conduct a regulatory agency database review to identify environmental cases along the Project alignment and a review of appropriate standard information sources to determine the potential for soil or groundwater contamination to occur at the sites. Follow-up sampling would be conducted as necessary to characterize soil and groundwater quality prior to construction and, if needed, site investigations or remedial activities would be performed in accordance with applicable laws. The environmental professional shall prepare a report that includes the following: activities performed for the assessment; summary of anticipated contaminants and contaminant concentrations at the Project site; or interfere with ongoing site remediation; and recommendations for appropriate handling of any contaminated materials during construction. The contractor shall also prepare a contingency plan identifying measures to be taken should unanticipated contamination be identified during construction.

HEA-2: Soil and Groundwater Management Plan. For all locations requiring soil disturbance where the pre-construction hazardous materials assessment (HEA-1) indicates the potential to encounter hazardous materials in the soil, the contractor shall prepare a soil and groundwater management plan that specifies the method for handling and disposal of contaminated soil and groundwater prior to

construction. The plan shall identify the disposal method for soil and the approved disposal site, and include written documentation that the disposal site will accept the waste. Contract specifications shall mandate full compliance will all applicable local, state, and federal regulations related to the identification, transportation and disposal of hazardous materials, including those encountered in excavated soil. The contractor shall provide the NPS with copies of hazardous waste manifests documenting that disposal of all hazardous materials has been performed in accordance with the law.

In addition, a water management plan shall describe measures for containment, handling, and disposal of groundwater (if encountered), runoff water used for dust control, stormwater runoff, and any other fluids generated during construction. Consistent with the requirements of the SWRCB General Permit for Storm Water Discharges Associated with Construction Activity, Project construction activities in San Francisco County shall be undertaken in accordance with a project-specific Storm Water Pollution Prevention Plan (SWPPP). The San Francisco Bay RWQCB, the primary agency responsible for protecting water quality within the Project area, would be responsible for reviewing and ensuring compliance with the SWPPP. This review is based on the general permit issued by the SWRCB.

The recommended BMPs, subject to the review and approval of the RWQCB, shall include the following measures. However, the measures themselves may be altered, supplemented or deleted during the RWQCB review process, since the RWQCB has final authority over the terms of the SWPPP.

- Store all hazardous materials in an area protected from rainfall and stormwater run-on and prevent the offsite discharge of leaks or spills.
- Prohibit on-site fueling of vehicles and construction equipment.
- Install coir rolls or other suitable measures to prevent sediment and potential contaminants from entering storm drain inlets.
- Minimize the potential for contamination of San Francisco Bay waters by maintaining spill containment and clean up equipment onsite, and by properly labeling and disposing of hazardous wastes.
- Locate waste collection areas close to construction entrances and away from roadways and storm drains.
- Inspect dumpsters and other waste and debris containers regularly for leaks and remove and properly dispose of any hazardous materials and liquid wastes placed in these containers.
- Train construction personnel in proper material delivery, handling, storage, cleanup, and disposal procedures.

HEA-3: Health and Safety Plan (HSP). The Project applicant shall prepare a project-specific Health and Safety Plan (HSP) in accordance with 29 CFR 1910 to protect construction workers and the public during all excavation, grading, and construction services. The HSP shall identify the following, but not be limited to:

- A summary of all potential risks to construction workers and maximum exposure limits for all known and reasonably foreseeable site chemicals present in soil, groundwater or surface water;

- Specified personal protective equipment and decontamination procedures, if needed;
- Safety procedures to be followed in the event suspected hazardous materials are encountered;
- Emergency procedures, including route to the nearest hospital; and
- The identification of a site health and safety officer and responsibilities of the site health and safety officer.

Conclusions. Alternative 2 would result in a short-term, minor, adverse impact because construction activities could expose the public to hazardous materials. However, this exposure would be minimal after implementation of the proposed mitigation measures and would be limited to the construction period.

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4.14 PUBLIC SERVICES AND UTILITIES

4.14.1 Methodology and Assumptions

Public services and utilities, for the purpose of this analysis, refers to the elements of infrastructure and services needed to support operation of the proposed historic streetcar extension.

The potential for change in public services and utilities proposed by the alternatives was evaluated by identifying projected changes in the ability of public service providers and utilities to adequately serve visitors and NPS employees of the San Francisco Maritime NHP and Fort Mason. The degree and duration of projected changes to public services and utilities was also evaluated.

The following thresholds were used in determining the significance of impacts to public services or utilities:

Impact Intensity	Impact Description
Negligible:	No effects on public services or utilities would occur, or the effects would be below or at low levels of detection.
Minor:	The effects on public services or utilities would be small but detectable, in a manner that would be noticeable to NPS staff and the public. In the case of adverse impacts, the Project would affect utilities or public services, but would not result in substantial degradation of service.
Moderate:	The effects on public services and utilities would be readily apparent. Substantial adverse or beneficial changes would be noticeable to NPS staff and the public. In the case of adverse impacts, the Project would result in short interruptions of utility services or substantial degradation in provision of public services such as fire protection response times.
Major:	The effects on public services or utilities would be readily apparent. Substantial adverse or beneficial changes would be noticeable to NPS staff and the public. In the case of adverse impacts, the Project would result in prolonged interruptions of utility services or inability to provide public services such as fire protection.

4.14.2 Impacts of Alternative 1—No-Action Alternative

Impact Analysis. The No Action Alternative would result in continued operation of the F-Line Streetcar service to its existing terminal at Jones Street. No construction of the proposed extension to Fort Mason would occur. This alternative would not attract additional visitors to the study area. Therefore, the demand for public services or utilities would remain unchanged. Police and fire protection services would continue to be provided to the study area and utilities would continue to meet demand generated by visitors and employees within the study area.

Cumulative Impacts. Alternative 1 would have no direct or indirect impacts on public services and utilities. As a result, there would be no cumulative impacts under this alternative.

Conclusions. There would be no impact to public services or utilities under this alternative.

4.14.3 Impacts of Alternative 2—Action Alternative (with Turnaround Options)

Impact Analysis. This alternative would result in the construction of new streetcar tracks along the following public streets: Jefferson, Leavenworth, and Beach. Construction of the proposed lines is anticipated to require the removal and/or replacement of existing utility lines within the public right-of-way along these streets as well as within the San Francisco Maritime NHP and Fort Mason. A critical utility in the study area is the Auxiliary Water Supply Source (AWSS) 20-inch line located within the street bed of Van Ness Avenue. The AWSS line would be cased for protection during the construction of the streetcar tracks as well as during operation.

Construction of the tracks along each block segment, between the existing terminal at Jones Street and the tunnel under Fort Mason, is anticipated to be 3 weeks on each side of the road, for a total of 6 weeks per block. Advance utility work prior to this construction is anticipated to be 4 weeks/side/block for a total of 8 weeks per block.

Any relocation or removal of utility lines, such as water, wastewater, gas, electricity, etc., would potentially result in the temporary disruption of service to visitors and employees of the San Francisco Maritime NHP and Fort Mason, and potentially to nearby residents and businesses. This would be considered a moderate adverse impact. Implementation of the mitigation measure discussed below would reduce the impact to minor and adverse.

Temporary minor adverse impacts would potentially result if construction activities such as lane closures, movement of construction equipment, or rerouting of public streets, cause an increase in vehicle, bicycle, or pedestrian accidents requiring response by emergency response providers. The ability of public safety providers to access areas affected by potential incidents would not be significantly constrained, either during construction or operation of the Proposed Action. It is also possible that personal safety could be at greater risk during construction activities because of the movement of large construction equipment and other construction activities. However, best management practices would be followed during construction and would minimize possible risks to personal safety.

Proposed improvements to the Fort Mason Tunnel could potentially subject construction workers to a greater risk of accident or injury due to its unique, confined construction work area. Operation of the F-Line through the tunnel would similarly impact visitors and operators of the streetcar line in the event of an accident in the tunnel. However, tunnel improvements would include ventilation systems, signals, lighting, and other safety system devices. Additional capacity would be built into the system to control the number of streetcars allowed west of the tunnel's eastern portal in order to ensure that more streetcars did not proceed west through the tunnel than could be handled by the proposed Fort Mason terminal. In addition, the SFMTA Muni currently operates streetcar lines through several existing tunnels in San Francisco; therefore, local emergency service providers would be adequately prepared for potential accidents and/or rescue operations within the tunnel.

Pacific Gas & Electric would provide traction power for SFMTA. The San Francisco Public Utilities Commission would provide power for streetlights for the operation of the historic streetcar.

Alternative 2A: North Loop Option. This option for the Fort Mason terminal would require reconfiguration of the existing parking lot at Fort Mason. Temporary minor adverse impacts would potentially result if construction activities within the parking lot cause an increase in accidents involving access to Fort Mason by vehicles, bicycles, or pedestrians. However, the ability of public safety providers to access the parking area would not be significantly constrained.

The proposed Fort Mason terminal location in the existing parking lot could also result in minor adverse impacts during operation of the F-Line due to an increase in accidents involving streetcars and/or other vehicles, bicycles, and pedestrians. Access to this area by emergency responders would not be significantly constrained by this configuration.

Alternative 2B: South Loop Option. Construction of the Fort Mason terminal in the Great Meadow would not require reconfiguration of the parking lot, thereby avoiding potential accidents involving access to the parking lot during the construction period. Partial lane closures of Laguna Street may be necessary to construct the new line and platform that is proposed adjacent to this street. The ability of safety providers to access the parking lot or the Great Meadow would not be significantly constrained.

The proposed Great Meadow location for the Fort Mason terminal would avoid potential accidents between streetcars and vehicles; incidents involving bicyclists and/or pedestrians with streetcars would remain a possibility, but access by emergency responders would not be significantly diminished.

Cumulative Impacts. Cumulative effects to public services and utilities are based on analysis of past, present, and reasonably foreseeable future actions, in combination with potential effects of this alternative. The projects identified include only those projects that could affect public services and utilities within the project area.

Past, present, and reasonably foreseeable projects in the project study area include: Fort Mason Sidewalk Replacement, Fort Mason Hazard Tree Replacement, upper Fort Mason Entry at Bay and Franklin Streets, Removal of Accessibility Barriers in upper Fort Mason, San Francisco Marina Renovation Project, 721 Beach Street Development, Aquatic Park Bathhouse Exhibit Plan and Installation, Fisherman's Wharf Public Realm Plan, San Francisco Maritime NHP, Municipal Pier Rehabilitation Project, Pier 2 shed restoration, Maritime Heritage Learning Center, and Doyle Drive. These projects are for the most part improvements to existing facilities in the long-term but could result in short-term adverse impacts to public services and utilities during construction.

The impacts of Alternative 2, when combined with the impacts of the cumulative projects described above, would have a local, short-term, minor, adverse cumulative impact on public services and utilities in the project area. The local, short-term, minor effect on public services and utilities would result from construction activities.

Mitigation Measures

PUB-1: Maintain Utility Services. A detailed study identifying locations of utilities within the study area shall be conducted during the design phase of the Proposed Action. For areas with the potential for adverse impacts to utility services, the NPS or its contractors shall implement the following mitigation measures:

- Utility excavation or encroachment permits shall be required from the appropriate agencies. The permits include measures to minimize utility disruption. The NPS and its contractors shall comply with permit conditions. Such conditions shall be included in construction contract specifications.
- Utility locations shall be verified through a field survey (potholing) and use of the Underground Service Alert services.
- Detailed specifications shall be prepared as part of the design plans to include procedures for excavation, support, and fill of areas around utility cables and pipelines. All affected utility services shall be notified of NPS's construction plans and schedule. Arrangements shall be made with these entities regarding protection, relocation, or temporary disconnection of services.
- Residents and businesses in the Project area shall be notified of planned utility service disruption in advance, in conformance with City and State standards.
- Disconnected cables and lines shall be reconnected promptly.

Conclusions. Moderate adverse impacts regarding the provision of public services and utilities could occur as a result of construction activities. These impacts would be reduced to minor adverse through implementation of the above mitigation measure.

Chapter 5
Sustainable and Long-Term Management

5.0 SUSTAINABLE AND LONG-TERM MANAGEMENT

5.1 RELATIONSHIP OF SHORT-TERM USES OF THE ENVIRONMENT AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses of the environment would result from project construction of the Streetcar Extension Project. In general, these activities would be of short duration, but the Project would have the potential to enhance long-term physical conditions and productivity of the environment because the Project would increase the use of transit.

Short-term impacts associated with construction activities include traffic disruption; restricted access to visitor resources such as parking areas and trails; disruption of vegetation; increased noise; fugitive dust emissions; and visual intrusions to visitors. The benefits of providing increased transit and access to long-term productivity would outweigh the short-term impacts resulting from construction.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are commitments where the resource would be permanently lost or consumed. Irreversible commitments would result from the construction of the new extension systems and the operation of a new system that would consume fossil fuels, labor, and roadway construction materials such as concrete and aggregate. The expenditure of federal funds and funds from other sources would be irretrievable. Some historic resources would be affected; impacts to these resources would be mitigated through various cultural landscape management requirements, but the impact would be irreversible.

The use of recreational land for track and platforms would be an irretrievable commitment of resources during the period the land is used for transportation infrastructure. However, the land could be converted to another use at a future date.

5.3 ADVERSE IMPACTS THAT CANNOT BE AVOIDED

Adverse impacts to historic resources in the Fort Mason Center and the Aquatic Park National Historic Landmark District would be unavoidable adverse impacts that could not be mitigated through alteration of the project's design.

The National Park Service also avoids impacts that it determines to be unacceptable (NPS 2006). Based on the analysis in this Draft Environmental Impact Statement, there would be no "unacceptable impacts" under the proposed project.

5.4 GROWTH-INDUCING IMPACTS

The Project would have no measurable impacts on growth in and around the Project. Although the project is expected to reduce the use of cars and encourage attendance to Fort Mason Center events, these impacts would not in and of themselves encourage population shifts.

Chapter 6
Consultation and Coordination

6.0 CONSULTATION AND COORDINATION

This chapter provides an overview of public involvement, consultation, and other requirements for the Project. It also includes a list of preparers.

6.1 HISTORY OF PUBLIC INVOLVEMENT

The Notice of Intent (NOI) for the project was published in the Federal Register on March 29, 2006. The NOI announced the preparation of an EIS by the National Park Service, as the federal lead agency. The NOI also provided information on project issues and potential impacts and invited comments, questions, and suggestions on the scope of the EIS during the 60-day public scoping period, which ended on May 29, 2006.

Public notification of the commencement of the planning process was made with postcards sent to approximately 4,000 individuals; the mailing list was developed from GGNRA, San Francisco Maritime NHP, and SFMTA databases. A half-page ad announcing the public scoping meeting and requesting input was placed in the *San Francisco Examiner* on May 3, 2006, and a legal notice was posted in the *San Francisco Chronicle* on May 6, 2006. Public and agency scoping meetings were held on May 9, 2006 at the Fort Mason Officer's Club in San Francisco. A meeting with the National Park Service and the cooperating agencies was held from 2:00 p.m. to 4:00 p.m. and the public meeting was held from 6:00 p.m. to 9:00 p.m.

During the scoping period, the National Park Service received over 100 comments from individuals, organizations representing environmental, conservation and recreational interests, and governmental agencies. The primary environmental concerns focused on changes in traffic and parking, impacts on parklands and recreational facilities, noise and vibration, visual impacts, and cultural resources.

6.2 CONSULTATIONS WITH OTHER AGENCIES AND ORGANIZATIONS

Input was also solicited from the National Park Service Historic Streetcar Extension Technical Advisory Committee (TAC), which consists of members of GGNRA, San Francisco Maritime NHP, SFMTA, Fort Mason Center, Market Street Railway, San Francisco County Transportation Authority, Golden Gate National Parks Conservancy, San Francisco Recreation and Park Department, and the Federal Transit Administration (FTA). National Park Service staff with expertise on park resources were also consulted. After the initial scoping period, the National Park Service continued to update the public about the project during the park's quarterly open houses.

6.3 SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT (NHPA)

6.3.1 Tribal Consultation

June 18, 2010 – Tribal Consultation Initiation letter submitted from NPS to Ohlone and Costanoan representatives inviting them to participate in consultation regarding the proposed undertaking in accordance with Section 106. The letter also provided information about and invited consultation on the efforts to identify indigenous archeological sites CA-SFr-23 and CA-SFr-29, including the findings of an archeological testing program near the South Loop Alternative (Great Meadow). One written response was received on July 15, 2010. Additional comments on the project were received during follow-up phone calls to letter recipients. These collective comments included concerns for protection of Ohlone sites and cultural materials, requests for additional information as it becomes available, offers to monitor future stages of project work if monitoring is required, and suggestions for the development of a treatment plan to address potential encounters with Ohlone cultural resources.

6.3.2 Agency Consultation

May 2, 2006 – Initiation of consultation including identification of APE

October 4, 2007 – Submittal of request for comment pursuant to NHPA for the project's undertaking to SHPO

December 3, 2007 – Receipt of letter acknowledging adequacy of NPS project scope and APE from SHPO to GGNRA and SF Maritime NHP

January 28, 2009 – Office of Historic Preservation briefing meeting in San Francisco

September 29, 2009 – Submittal of historic structures and archeological reports for historic property identification to SHPO

December 17, 2010 – Submittal of Finding of Effects letter from NPS to SHPO

Future Consultation

Letter from NPS to the Secretary of the Interior inviting consultation on resolution of adverse effects
Draft Memorandum of Agreement (MOA)

6.4 FUTURE COMPLIANCE REQUIREMENTS

The following is a preliminary list of potential compliance requirements for the project.

Regulation	Agency	Compliance Requirement
Section 106, National Historic Preservation Act (1966)	Advisory Council on Historic Preservation and State Historic Preservation Officer	Section 106 consultation, memorandum of agreement on the undertaking

Regulation	Agency	Compliance Requirement
San Francisco Bay Plan (2003)	San Francisco Bay Conservation and Development Commission (BCDC)	Permit approval for work within 100 feet of Bay shoreline
Coastal Zone Management Act (1972)	San Francisco Bay Conservation and Development Commission (BCDC)	Federal Consistency determination
Clean Water Act (1972), Section 402, National Pollutant Discharge Elimination System (NPDES)	Regional Water Quality and Control Board	General Construction Permit
Clean Water Act (1972)	State Water Resources Control Board	Storm Water Pollution Prevention Plan (SWPPP)
City Codes	City and County of San Francisco	construction permits as appropriate

6.5 LIST OF PREPARERS / LIST OF PERSONS AND AGENCIES CONSULTED

6.5.1 National Park Service

Golden Gate National Recreation Area

Frank Dean, Acting Superintendent
Aaron Roth, Acting Deputy Superintendent
Rick Foster, Transportation Planner (preparer)
Carey Feierabend, Park Planner
Daphne Hatch, Chief of Natural Resources
Nancy Hornor, Chief of Planning and Technical Services
Lance Lewis, Safety Officer
Bill Merkle, Wildlife Ecologist
Yvette Ruan, Chief Park Ranger
Steve Ortega, Environmental Protection Specialist (preparer)
Michael Savidge, Program Management
Jerry Scheumann, Facility Manager
Paul Scolari, PhD., Historian
Tamara Williams, Hydrologist
Brian Ullensvang, Environmental Engineer

San Francisco Maritime National Historical Park

Craig Kenkle, Superintendent
Lynn Cullivan, Management Assistant
Robbyn Jackson, Chief of Cultural Resources and Museum Management
Tim Przygocki, Safety Officer

Denver Service Center

Patrick Shea, Project Manager, Transportation Technical Specialist (preparer)
Steven Culver, Natural Resource Specialist (preparer)
Lee Terzis, Cultural Resource Specialist (preparer)

Pacific West Regional Office of the National Park Service
Alan Schmierer, Regional Environmental Coordinator
Elaine Jackson-Retondo, PhD., National Register & National Historic Landmarks Program
Judy Rocchio, Air Quality - Natural Sounds - Dark Night Skies

National Park Service Washington Support Office
Vicki McCusker, Natural Resources Specialist, Natural Sounds and Night Skies Division

6.5.2 Consultants

ESA
Darcey Rosenblatt, Project Manager (preparer)
Erin Higbee-Kollu, Deputy Project Manager (preparer)
Jack Hutchison, P.E., Senior Transportation Engineer (preparer)
W. Brad Brewster, Manager, Bay Area Cultural Resources (preparer)
Nik Carlson, Socioeconomics section (preparer)
Chris Sanchez, Noise and Air Quality section (preparer)
Kirstin Conti, Geological Resources section (preparer)
Dana Ostfeld, Biological Resources section (preparer)
Cory Barringhaus, Public Services and Utilities section (preparer)

Page & Turnbull
Rich Sucre, Architectural Historian (preparer)
Jay Turnbull, Architectural Historian (preparer)

Kirk Associates, LLC
Steve Garrett, Value Analysis Facilitator (preparer)

Environmental Vision
Chuck Cornwall, Principal Visual Specialist (preparer)
Marsha Gale, Managing Principal (preparer)

URS Corporation
Linda Peters, Environmental Specialist
Sandy Stadtfeld, Vice President at URS
Duncan Watry, Senior Transportation Planner

6.5.3 State Historic Preservation Officer, Advisory Council, Tribes

Milford Wayne Donaldson, State Historic Preservation Officer
Advisory Council on Historic Preservation
Ohlone/Costanoan Tribe

6.5.4 San Francisco Municipal Transportation Agency

Dan Rosen, Transit Manager
Darton Ito, Manager of Long Range & Capital Planning, Sustainable Streets Division
John Sadorra, Deputy Director, Fleet Services & Constructability
Daniel Pulon, Principal Transportation Planner, Capital System Planning

6.5.5 Federal Transit Administration

Alexander Smith, Community Planner

6.5.6 Technical Advisory Committee

Fort Mason Center (FMC):
Ann Lazarus, Fort Mason Center Executive Director
Doug Wright, Consultant
Jerry Goldberg, Consultant

Market Street Railway:
Rick Laubscher, Market Street Railway President

San Francisco County Transportation Authority:
Jesse Koehlerr, Transportation Planner
Richard Crockett

6.6 LIST OF RECIPIENTS AND REVIEWERS

Limited printed paper copies will be available for distribution; however, paper copies will be available for review at the lead agencies offices or in local libraries

Federal Agencies

Advisory Council on Historic Preservation
Department of Transportation, Federal Highway Administration
Environmental Protection Agency
The Presidio Trust

Tribes

Ohlone/Costanoan Tribe

California State Agencies

California Office of Historic Preservation
Coastal Commission
Coastal Conservancy
Department of Fish and Game
Department of Parks and Recreation
Department of Transportation, District 4

Regional and Local Agencies

Association of Bay Area Governments
Bay Area Air Quality Management District
City and County of San Francisco

–Office of the Mayor
–San Francisco Planning Department
–Department of Environment
–Department of Public Works
–Department of Recreation and Parks
Metropolitan Transportation Commission
San Francisco Regional Water Quality Control Board
San Francisco Bay Conservation and Development Commission

Organizations

National Parks Conservation Association, Office of Preservation
San Francisco Bay Trail Association

Elected Officials and Committees

Office of Senator Barbara Boxer
Office of Senator Dianne Feinstein
Office of Representative Nancy Pelosi
Office of Representative Jackie Speier
United States House of Representatives Committee on Resources
Office of Mayor Gavin Newsom

Appendixes

APPENDIXES

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APPENDIX A1

Fort Mason Center Parking Impact Notice

Appendix A1 presents a list of the major events hosted by the Fort Mason Center in 2010. Attendance numbers are projections.

To: Staff/Residents
From: Lisa Phillips
Subject: **PARKING IMPACT**
Date: January 2010
February 2010

FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
JANUARY					
Rock With You: A Tribute to Michael Jackson, Latin Style	Cowell Theater	Fri Jan 22 Sat Jan 23	8pm 4pm, 8pm	437	No
Rent	Southside Theatre	Fri Jan 22 Sat Jan 23	8pm	Theater capacity: 162	No
BATS Improv	Bayfront Theatre	Fri Jan 22 Sat Jan 23	8pm 8pm	Theater capacity: 200	No
Oedipus el Rey	Magic Theatre	Thur Jan 28	8pm	Theater capacity: 320	No
ZAP Good Eats	Herbst Pavilion	Thur Jan 28	6-9pm	1,000	No
ZAP Wine Tasting	Herbst & Festival Pavilion	Sat Jan 30	10am-5pm	7,000	No
Rumpelstiltskin	Young Performers Theatre	Sat Jan 30 Sun Jan 31	1pm 1pm, 3:30pm	Theater capacity: 100	No
FEBRUARY					
Casky & Lees Arts of Pacific Asia	Festival Pavilion	Thu Feb 4 Fri Feb 5 Sat Feb 6 Sun Feb 7	6pm-9pm Gala 11am-7pm 11am-7pm 11am-5pm	500 2,000 2,000 1,500	Gala: Valet Lot E & City Yachts Daily Valet in Lot E
Oedipus el Rey	Magic Theatre	Thur Feb 4	8pm	Theater capacity: 320	No
Rumpelstiltskin	Young Performers Theatre	Sat Feb 6 Sun Feb 7	1pm 1pm, 3:30pm	Theater capacity: 100	No
Warehouse Sale	Herbst Pavilion	Sat Feb 5	10am-4pm	1,000	No
2010 San Francisco Fine Print Fair	Conference Center	Fri Feb 5 Sat Feb 6 Sun Feb 7	6pm-9pm 10am-6pm 11am-5pm	100 200 200	No
Huun Huur Tu: Xoomei -- Tuvan Throat Singing	Cowell Theater	Thu Feb 11	8pm	200	No
Casky & Lees Tribal Arts	Festival Pavilion	Thu Feb 11 Fri Feb 12 Sat Feb 13 Sun Feb 14	6pm-9pm Gala 11am-7pm 11am-7pm 11am-5pm	500 1,500 1,500 1,000	Gala: Valet Lot E & Daily Valet in Lot E

To: Staff/Residents
From: Lisa Phillips
Subject: **PARKING IMPACT**
Date: January 2010
February 2010

FORT MASON CENTER
SAN FRANCISCO

Rumpelstiltskin	Young Performers Theatre	Sat Feb 13 Sun Feb 14	1pm 1pm, 3:30pm	Theater capacity: 100	No
Oedipus el Rey	Magic Theatre	Thu Feb 11	8pm	Theater capacity: 320	No
Eurythmy Dance Concert	Cowell Theater	Fri Feb 12 Sat Feb 13	8pm 2pm	430 / day	No
Usmp Event	Herbst Pavilion	Sat Feb 20	7-11pm	1,000	Reserved lot C & D for 70 spaces
Chronicle Wine Competition	Festival Pavilion	Sat Feb 20	11am-5pm	3500/ day	No
Rent	Southside Theatre	Sat Feb 20	8pm	Theater capacity: 162	No
BATS Improv	Bayfront Theatre	Sat Feb 20	8pm	Theater capacity: 200	No
Oedipus el Rey	Magic Theatre	Sat Feb 20	8pm	Theater capacity: 320	No
Gambere Rosso Wine Tasting (private)	Herbst Pavilion	Wed Feb 24	12pm-7pm	1,000	No
Ellis Wood Dance	Cowell Theater	Sat Feb 27	8pm	430 / day	No
Pacific Orchid Show	Festival Pavilion	Fri Feb 26 Sat Feb 27 Sun Feb 28	10am-10pm 9am-6pm 10am-5pm	2,000 3,500 3,500	No
BATS Improv	Bayfront Theatre	Fri Feb 26	8pm	Theater capacity: 200	No
Oedipus el Rey	Magic Theatre	Fri Feb 26	8pm	Theater capacity: 320	No

To: Staff/Residents
From: Lisa Phillips
Subect: **PARKING IMPACT**
Date: March 2010

FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Art Du Jour Okizu Foundation Gala	Herbst Pavilion	Sat Mar 6	5pm-11pm	450	No
Academy of Friends Gala	Festival Pavilion	Sun Mar 7	5:00pm-11pm	3,000	Valet
Great SF Crystal Fair	Conference Cneter	Sat Mar 6 Sun Mar 7	10am-6pm 10am-4pm	300	No
Charlie & the Chocolate Factory	Young Performers Theatre	Sat Mar 6 Sun Mar 7	1pm, 1pm, 3:30pm	Theater capacity: 100	No
Oedipus el Rey	Magic Theatre	Sat Mar 6 Sun Mar 7	8pm 2:30pm	Theater capacity: 320	No
BATS Improv	Bayfront Theatre	Sat Mar 6 Sun Mar 7	8pm 7pm	Theater capacity: 200	No
Stark Carpet Warehouse Sale	Herbst Pavilion	Thur Mar 11 Fri Mar 12 Sat Mar 13 Sun Mar 14	10am-8pm 10am-8pm 10am-8pm 10am-6pm	1000/ day	No
Contemporary Crafts Market	Festival Pavilion	Sat Mar 13 Sun Mar 14	10am-5pm 10am-5pm	800-1,500 / day	Shuttle Marina Middle School
Hi Ho Silver	Marina Room	Sat Mar 13 Sun Mar 14	11am-5pm 11am-4pm	200/ day	No
Charlie & the Chocolate Factory	Young Performers Theatre	Sat Mar 13 Sun Mar 14	1pm, 1pm, 3:30pm	Theater capacity: 100	No
Oedipus el Rey	Magic Theatre	Sat Mar 13 Sun Mar 14	8pm 2:30pm	Theater capacity: 320	No
BATS Improv	Bayfront Theatre	Sat Mar 13 Sun Mar 14	8pm 7pm	Theater capacity: 200	No
A Memory. a Monologue, a Rant and a Prayer	Southside Theater	Fri Mar 12 Sat Mar 13	8pm 2pm, 8pm	Theater capacity: 162	No
SF International Chocolate Salon	Festival Pavilion	Sat Mar 20	10am-6pm	1,000	No
Spring Dance Inspiration 2009	Cowell Theater	Sat Mar 20 Sun Mar 21	8pm 3pm	300	No
Charlie & the Chocolate Factory	Young Performers Theatre	Sat Mar 20 Sun Mar 21	1pm, 1pm, 3:30pm	Theater capacity: 100	No
BATS Improv	Bayfront Theatre	Sat Mar 20 Sun Mar 21	8pm 7pm	Theater capacity: 200	No
CLAWS Bark	Herbst Pavilion	Thu Mar 25	6pm-11pm	500	No
Rhone Rangers Grand Tasting	Festival Pavilion	Sun Mar 28	1:30pm-4pm	2500/ day	No

To: Staff/Residents
From:Lisa Phillips
Subject: **PARKING IMPACT NOTICE--APRIL 2010**
Date: April 2010

FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Salmon Summit	Conference Center	Thur Apr 1	10am-3pm	300	No
Bay Area Derby Girls	Herbst Pavilion	Sat Apr 3	8pm-10pm	1,200	No
BATS Improv	Bayfront Theater	Sat Apr 3	8pm	Theater capacity: 200	No
SF Conservatory of Music Opera: The Rake's Progress	Cowell Theater	Sat Apr 10 Sun Apr 11	7:30pm 2:00pm	Theater capacity: 437	No
San Francisco Vintner's Market	Festival Pavilion	Sat Apr 10 Sun Apr 11	12pm-5pm 12pm-5pm	2,000 per day	FMC Valet
Airnb Presents: Private Reception	Conference Center	Sat Apr 10	5pm-2am	300	No
The Twitter	Herbst Pavilion	Wed Apr 14 Thu Apr 15	6:00pm thru 6:00pm next day	400-800	No
"Pupi" Sicilian Puppet Theatre	Cowell Theater	Thu Apri 15	7pm	400	No
Cathedral School for Boys Gala Fundraiser	Herbst Pavilion	Sat Apr 17	6pm-12am	400	No
An Accident	Magic Theatre	Thu Apr 15 Sat Apr 17 Sun Apr 18	8pm 8pm 2:30pm	Theater capacity: 320	No
BATS Improv	Bayfront Theater	Sat Apr 17 Sun Apr 18	8pm 7pm	Theater capacity: 200	No
Tell It Slant	Southsde Theater	Sat Apr 17 Sun Apr 18	8pm 2pm	Theater Capacity: 162	No
City Dance: Spring on Stage	Cowell Theater	Sat Apr 17	7:30pm 2:00pm	400	No
A Taste of Tamales by the Bay	Conference Center	Sun Apr 18	12pm-4:30pm	300	No

To: Staff/Residents
From:Lisa Phillips
Subject: **PARKING IMPACT NOTICE--APRIL 2010**
Date: April 2010

FORT MASON CENTER
SAN FRANCISCO

San Francisco International Beerfest	Festival Pavilion	Sat Apr 24	7pm-10pm	3000 **SOLD OUT**	No
Vietnamese Poetry Festival	Fleet Room	Sat Apr 24	7pm	200	No
Peter & the Wolf	Young Performers Theatre	Sat Apr 24 Sun Apr 25	1pm, 1pm, 3:30pm	Theater capacity: 100	No
An Accident	Magic Theatre	Sat Apr 24 Sun Apr 25	2:30pm, 8pm 2:30pm	Theater capacity: 320	No
BATS Improv	Bayfront Theater	Sat Apr 24 Sun Apr 25	8pm 7pm	Theater capacity: 200	No
Tell It Slant	Southsde Theater	Sat Apr 24 Sun Apr 26	8pm 2pm	Theater Capacity: 162	No
Toe to Toe: The Grand Slam	Herbst Pavilion	Thu Apr 29	6:30pm-9:30pm	400	No
An Accident	Magic Theatre	Thu Apr 30	8pm	Theater capacity: 320	No

To: Staff/Residents
From: Lisa Phillips
Subject: **PARKING IMPACT NOTICE MAY 2010**
Date: May 2010

FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Norway Days	Herbst Pavilion	Sat May 1 Sun May 2	8am-5pm 10am-4pm	1500 per day	No
Peter and the Wolf	Young Performers Theatre	Sat May 2 Sun May 3	1pm 1pm & 3:30pm	Theater capacity: 100	No
BATS Improv	Bayfront Theater	Fri May 1 Sat May 2	8pm	Theater capacity: 200	No
Tell It Slant	Southsde Theater	Fri May 1 Sat May 2	8pm 2pm, 8pm	Theater Capacity: 162	No
An Accident	Magic Theatre	Fri May 1 Sat May 2 Sun May 3	8pm 8pm 2:30pm, 7pm	Theater capacity: 320	No
SFMOMA Artists Gallery 14th Annual Warehouse Sale	Bldg. A	Wed May 5	6:00pm-9:00pm gala reception	300	No
Wine Wearhouse	Herbst Pavilion	Wed May 5	12pm-7pm	1,000	no
SF Underground	Festival Pavilion	Sat May 8	10am-11:30pm	2,000	No
LINES Ballet School Ensemble	Cowell Theater	Fri May 7 Sat May 8	8pm	400	No
Tell It Slant	Southsde Theater	Fri May 7 Sat May 8 Sun May 9	8pm 8pm 2pm, 8pm	Theater Capacity: 162	No
An Accident	Magic Theatre	Sat May 8 Sun May 9	8pm 2:30pm, 7pm	Theater capacity: 320	No
BATS Improv	Bayfront Theater	Sat May 8 Sun May 9	8pm 7pm	Theater capacity: 200	No
Peter and the Wolf	Young Performers Theatre	Sat May 8 Sun May 9	1pm 1pm & 3:30pm	Theater capacity: 100	No
SF Art Institute MFA Graduate Exhibition Opening Night Gala	Herbst Pavilion	Thu May 13	7pm-10pm	500	No
PCBA Book Arts and Printers Fair	Conference Center	Sat May 15	9am-3pm	300	No

To: Staff/Residents
From: Lisa Phillips
Subject: **PARKING IMPACT NOTICE MAY 2010**
Date: May 2010

FORT MASON CENTER
SAN FRANCISCO

SF Art Institute MFA Graduate Exhibition	Herbst Pavilion	Sat May 15 thru Sat May 22	12pm-6pm	200 per day	No
20th Annual Star Chefs & Vintners Gala for Meals On Wheels	Festival Pavilion	Sun May 16	5pm-11pm	700	Valet Lots C,D & Lots 1,2
BATS Improv	Bayfront Theater	Sat May 15 Sun May 16	8pm 7pm	Theater capacity: 200	No
Tell It Slant	Southsde Theater	Sat May 15 Sun May 16	8pm 2pm	Theater Capacity: 162	No
School of the Arts Dance Concert: Intention	Cowell Theater	Fri May 14 Sat May 15 Sun May 16	8pm 8pm 2pm	350	No
SF Fine Art Fair	Festival Pavilion	Thu May 20 Fri May 21 Sat May 22 Sun May 23	Preview 6-9:30pm 12pm-8pm 11am-7pm 12pm-6pm	1,500	No
Derevo	Cowell Theater	Thu May 20 Fri May 21 Sat May 22	8pm 8pm 8pm	Theater capacity: 437	No
Studio Rue Dance Dana Lawton Dance	Southside Theater	Thu May 20 Sat May 22	8:30pm 9pm 2pm	Theater capacity: 162	No
BATS Improv	Bayfront Theater	Fri May 21 Sat May 21	8pm 8pm	Theater capacity: 200	No

To: Staff/Residents
From: Lisa Phillips
Subject: **PARKING IMPACT NOTICE**
Date: June 2010

FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
ExpressionEngine CodeIgniter Conference 2010	Conference Center	Mon May 31 Tue Jun 1 Wed Jun 2	9am-6pm 8am-6pm 8am-6pm	300 per day	No
Alliant International Graduation	Herbst Pavilion	Fri Jun 4	1-5 pm	900	Reserved parking between Bldings. C & D 50 spaces
CFA Examination	Festival Pavilion	Sat Jun 5	8am-5pm	2,283	No
Crush Barrel Wine Market	Fleet Room	Sat Jun 5	12-5pm	500	No
TAPAS Grand Tasting	Conference Center	Sat Jun 5	2-5pm	800	Reserved parking between Bldings. C & D 80 spaces
City Ballet School Spring Dance	Cowell Theater	Sat Jun 5	2pm 7pm	300	No
Synergy School Bay Area Voices	Northside Theater	Sat Jun 6	8:00pm	Theater capacity: 160	No
San Francisco Birth & Baby Fair	Herbst Pavilion	Sun Jun 6	10-5pm	800	No
Fort Mason Center Farmers Market	Parking Lot	Starting Sun Jun 6 **Every Sunday**	9:30am-1:30pm	High Attendance expected	No
Dance Without Borders	Cowell Theater	Sun Jun 6	5-7pm	Theater capacity: 437	No
BATS Improv	Bayfront Theater	Fri Jun 4 Sat Jun 5 Sun Jun 6	8pm 8pm 7pm	Theater capacity: 200	No
Shecky's Girls Night Out	Herbst Pavilion	Wed Jun 9 Thu Jun 10	5-10pm 5-10pm	400-500	No
Great SF Crystal Fair	Conference Center	Sat Jun 12 Sun Jun 13	10-6pm 10-4pm	300	No
Chamberdance	Cowell Theater	Sat Jun 12 Sun Jun 13	8pm 3pm	300	No

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BATS Improv	Bayfront Theater	Fri Jun 12 Sat Jun 13 Sun Jun 14	8pm 8pm 7pm	Theater capacity: 200	No
Slow Food "Golden Glass Wine Tasting"	Festival Pavilion	Sat Jun 12	1-5pm	2,000	No
Swinerton Private Event	Herbst Pavilion	Fri Jun 18	7:30am-4pm	300	No
Swinerton Private Event	Cowell Theater	Fri Jun 18	7:30am-4pm	300	No
Glory Glory	Northside Theater	Fri Jun 18 Sat Jun 19 Sun Jun 20	8pm 8pm 7pm	Theater capacity: 162	No
Bay Area Derby Girls	Herbst Pavilion	Sat Jul 19	7-11:00pm	1,200	No
BATS Improv	Bayfront Theater	Fri Jun 18 Sat Jun 19 Sun Jun 20	8pm 8pm 7pm	Theater capacity: 200	No
New Old Time Chautauqua Keep the Faith	Cowell Theater	Sat Jul 19	7:30pm	Theater capacity: 437	No
Glory Glory	Northside Theater	Fri Jun 25 Sat Jun 26 Sun Jun 27	8pm 8pm 2pm	Theater capacity: 162	No
BATS Improv	Bayfront Theater	Fri Jun 25 Sat Jun 26 Sun Jun 27	8pm 8pm 7pm	Theater capacity: 200	No
Pinot Days Grand Tasting	Festival Pavilion	Sun Jun 27	11am-5pm	2,000	No

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Date: July 2010

FORT MASON CENTER
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Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Crush Barrel Wine Market	Fleet Room Bldg D	Sat Jul 3	12pm-5pm	300	No
FMC Farmers' Market	FMC Parking Lot	Sun Jul 4	9:30am-1:30pm	3,000	No
BATS Improv	Bldg B	Fri Jul 9 Sat Jul 10	8pm 8pm	Theater capacity: 200	No
Easily Distracted Theatre: Foresight	Southside Theater	Fri Jul 9 Sat Jul 10 Sun Jul 11	8pm 8pm 2pm, 8pm	Theater capacity: 162	No
Asahar Dance Foundation Zahara	Cowell Theater	Fri Jul 9	8pm	Theater capacity: 437	No
Avon Walk for Breast Cancer	Great Meadow Upper Fort Mason	Sat Jul 10 Sun Jul 11	Begin: 5:30am End: 3:00pm	High Volume	car entrance to FMC could be impacted as walkers pass by
The Guardsman Roundup	Herbst Pavilion	Sat Jul 10	8:30pm-1am	1,000	No
FMC Farmers' Market	FMC Parking Lot	Sun Jul 11	9:30am-1:30pm	3,000	No
The BreastFest	Herbst Pavilion	Sat Jul 17	12pm-5pm	1,000	No
Lamb Jam San Francisco	Festival Pavilion	Sun Jul 18	1pm-4pm	1,000	No
Easily Distracted Theatre: Foresight	Southside Theater	Fri Jul 16 Sat Jul 17 Sun Jul 18	8pm 8pm 2pm, 8pm	Theater capacity: 162	No
Post:Ballet--Concert One	Cowell Theater	Fri Jul 16 Sat Jul 17	8pm	Theater capacity: 434	No
BATS Improv	Bayfront Theater	Fri Jul 16 Sat Jul 17 Sun Jul 18	8pm 8pm 2pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Jul 18	9:30am-1:30pm	3,000	No
Bay Area Producers Conference	Cowell Theater	Sat Jul 24 .	11am-10pm	Theater capacity: 437	No
BATS Improv	Bayfront Theater	Fri Jul 23 Sat Jul 24 Sun Jul 25	8pm 8pm 2pm	Theater capacity: 200	No
BASOTI *Mozart's The Magic Flute*	Northside Theater	Thu Jul 22 Fri Jul 23 Sat Jul 24 Sun Jul 25	8pm 8pm 8pm 2pm	Theater capacity: 162	No

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Indoor Gardening Exposition	Festival Pavilion	Sat Jul 24 Sun Jul 25	10am-6pm 12pm-6pm	800	No
San Francisco Marathon	passes thru Fort Mason	Sun Jul 25	5:30-8:30am	8,000	car entrance to FMC will be impacted as racers pass by
FMC Farmers' Market	FMC Parking Lot	Sun Jul 25	9:30am-1:30pm	3,000	No
Barney 's New York	Herbst Pavilion	Thu Jul 29 Fri Jul 30 Sat Jul 31	10-8pm	600	No
Renegade Craft Fair	Festival Pavilion	Sat Jul 31 Sun Aug 1	11-7pm 11-7pm	1,000	No
Hi Ho Silver	Gatehouse	Sat Jul 31 Sun Aug 1	10:30-4pm 11-5pm	100	No
BATS Improv	Bayfront Theater	Fri Jul 30 Sat Jul 31	8pm 8pm	Theater capacity: 200	No
BASOTI ***Mozart's The Magic Flute***	Northside Theater	Fri Jul 30 Sat Jul 31	8pm 8pm	Theater capacity: 162	No
West Coast Country Music Festival	Great Meadow Upper Fort Mason	Sat Jul 31	11am-7pm	3,000	No

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Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Barneys New York Warehouse Sale	Herbst Pavilion	Mon Aug 2 Tue Aug 3 Wed Aug 4 Thu Aug 5 Fri Aug 6 Sat Aug 7 Sun Aug 8	10am-8pm 10am-8pm 10am-8pm 10am-8pm 10am-8pm 10am-7pm 10am-7pm	600 per day	No
SF Opera Merlola L'Elisir d'Amore	Cowell Theater	Fri Aug 6 Sat Aug 7 Sun Aug 8	8pm 8pm 2pm	Theater capacity 437	No
Hi Ho Silver	Marina Room	Fri Aug 6 Sat Aug 7 Sun Aug 8	11-4pm 10-5pm 11-4pm	100	No
Off the Grid	FMC Parking Lot	Fri Aug 6	5pm-9pm	800	Main Parking lot front of building C
Angel Island: Immigrant Gateway to America	Conference Center Bldg. A	Sat Aug 7	1:30pm-4pm	180	No
FMC Farmers' Market	FMC Parking Lot	Sun Aug 8	9:30am-1:30pm	3,000	Parking lot front of building A
Crush Barrel Wine Market	Fleet Room Bldg. D	Sun Aug 9	12pm-5pm	300	No
BATS Improv	Bayfront Theater	Fri Aug 7 Sat Aug 8	8pm 8pm	Theater capacity: 200	No
Fabulous Fashionista Sample Sale	Fleet Room Bldg. D	Sat Aug 14	10-3pm	200	No
ACC Craft Fair 2007	Herbst & Festival Pavilion	Fri Aug 13 Sat Aug 14 Sun Aug 15	10-8pm 10-6pm 10-5pm	2,000 +	Yes
Hi Ho Silver	Marina Room	Fri Aug 13 Sat Aug 14 Sun Aug 15	11-4pm 10-5pm 11-4pm	100	No
Off the Grid	FMC Parking Lot	Fri Aug 13	5pm-9pm	800	Main Parking lot front of building C
BATS Improv	Bayfront Theater	Fri Aug 13 Sat Aug 14	8pm 8pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Aug 15	9:30am-1:30pm	3,000	Parking lot front of building A
LINES Ballet Summer Showcase	Cowell Theater	Tue Aug 17	8pm	Theater capacity 437	No

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Family Winemakeers of California	Festival Pavilion	Sun Aug 22 Mon Aug 23	3-6pm Trade only	1,200-2,000	Yes, Section E
Vintage European Posters Show	Firehouse	Fri Aug 20 Sat Aug 21 Sun Aug 22	10-6pm 10-6pm 11-5pm	150	No
Off the Grid	FMC Parking Lot	Fri Aug 20	5pm-9pm	800	No
BATS Improv	Bayfront Theater	Fri Aug 20 Sat Aug 21	8pm 8pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Aug 22	9:30am-1:30pm	3,000	Parking lot front of building A
Lyric Theatre **The Dollar Princess**	Southside Theater	Sat Aug 28 Sun Aug 29	8pm 2pm	Theater capacity: 168	No
Off the Grid	FMC Parking Lot	Fri Aug 27	5pm-9pm	800	Main Parking lot front of building C
FMC Farmers' Market	FMC Parking Lot	Sun Aug 29	9:30am-1:30pm	3,000	Parking lot front of building A
BATS Improv	Bayfront Theater	Fri Aug 27 Sat Aug 28	8pm 8pm	Theater capacity: 200	No

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FORT MASON CENTER
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Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Off the Grid	FMC Parking Lot	Fri Sep 3	5pm-9pm	800	Main Parking lot front of building C
BATS Improv	Bayfront Theater	Fri Aug 3 Sat Aug 4	8pm 8pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Sep 5	9:30am-1:30pm	3,000	Parking lot in front of Bldg. A
Ceramics Annual of America	Herbst Pavilion	Thu Sep 9 Fri Sep 10 Sat Sep 11 Sun Sep 12	5:30-8pm 10-8pm 10-8pm 10-6pm	400-600 per day	No
Off the Grid	FMC Parking Lot	Fri Sep 10	5pm-9pm	800	Main Parking lot front of building C
BATS Improv	Bayfront Theater	Fri Aug 10 Sat Aug 11	8pm 8pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Sep 12	9:30am-1:30pm	3,000	Parking lot in front of Bldg. A
Bank of America Private Event	Herbst Pavilion	Mon Sep 13	5-10pm	450	Valet Parking Lot E
San Francisco Modernism (SF20)	Festival Pavilion	Thu Sep 16 Fri Sep 17 Sat Sep 18 Sun Sep 19	6-9pm 11-7pm 11-7pm 12-5pm	400 700 700 700	Valet Parking Opening Nite
The Brothers Size	Magic Theatre	Preview Thu Sep 16 Sat Sep 18 Sun Sep 19	8pm 2:30pm, 8pm 2:30pm	Theater capacity: 162	No
Zhukov Dance Theatre Product 03	Cowell Theater	Thu Sep 16 Sat Sep 18 Sun Sep 19	8pm 8pm 8pm	Theater capacity: 437	No
SFMOMA Artists Gallery Reception	Building A	Thu Sep 16	5:30-7:30pm	300	No
Haute Life PR & Marketing	Herbst Pavilion	Thu Sep 16	5-10pm	1,000	No
Off the Grid	FMC Parking Lot	Fri Sep 17	5pm-9pm	800	Main Parking lot front of building C

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BATS Improv	Bayfront Theater	Fri Aug 17 Sat Aug 18	8pm 8pm	Theater capacity: 200	No
FMC Farmers' Market	FMC Parking Lot	Sun Sep 19	9:30am-1:30pm	3,000	Parking lot in front of Bldg. A
San Francisco Hip Hop DanceFest Auditions	Cowell Theater	Sun Sep 19	11am 3:30pm	Theater capacity: 437	No
Non-Profit Housing Association of CA: NPH Fall Conference	Herbst Pavilion	Tue Sep 21	8am-5:30pm	450	No
Annual Big Book Sale	Festival Pavilion	Tue Sep 21 Wed Sep22 Thu Sep 23 Fri Sep24 Sat Sep 25 Sun Sep 26	4-8pm 10-8pm 10-8pm 10-8pm 10-8pm 10-4pm	2,000 +	No
Off the Grid	FMC Parking Lot	Fri Sep 24	5pm-9pm	800	Main Parking lot front of building C
BATS Improv	Bayfront Theater	Fri Sep 24 Sat Sep 25	8pm 8pm	Theater capacity: 200	No
The Brothers Size	Magic Theatre	Fri Sep 24 Sat Sep 25	8pm 2:30pm, 8pm	Theater capacity: 162	No
Summer Search	Herbst Pavilion Cowell Theater	Fri Sep 24	4-11pm	450	Valet Parking
FMC Farmers' Market	FMC Parking Lot	Sun Sep 26	9:30am-1:30pm	3,000	Parking lot in front of Bldg. A
Pinocchio	Young Performers Theatre	Sat Sep 25 Sun Sep 26	1pm 1pm & 3:30pm	Theater capacity: 100	No
West Coast Green	Festival Herbst Southside Theater Building C	Wed Sep 29 Thu Sep 30 Fri Oct 1 Sat Oct 2	8am-4pm 7am-6pm 7am-6pm 7am-6pm	800-900	No

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FORT MASON CENTER
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Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
West Coast Green	Festival Herbst Southside Theater Building C	Fri Oct 1 Sat Oct 2	7am-6pm 7am-6pm	800-900	No
Bridge to Bridge Run	N/A	Sun Oct 3	9-10:30am will pass FMC gates	10,000	No
SOCAP 2010	GG Room Herbst Cowell Fleet Room Building C	Mon Oct 4 Tue Oct 5 Wed Oct 6	8am-9pm daily	900	No
Pinocchio	Young Performers Theatre	Sat Oct 2 Sun Oct 3	1pm, 3:30pm 1pm, 3:30pm	Theater capacity: 100	No
Fleet Week	N/A	Thu Oct 7 Fri Oct 8 Sat Oct 9 Sun Oct10	Blue Angels at 3pm each day	High Attendance expected on Sat, Sun	No
Navy in Space	Fleet Room	Sat Oct 9 Sun Oct 10	9-5pm	1500/day	No
Summersalt	Herbst Festival and outdoors between building C/D	Sat Oct 9	11am-8pm	3,000	Lot between C/D
BATS Improv	Bayfront Theatre	Fri Oct 8 Sat Oct 9	8pm	Theater capacity: 200	No
The Brothers Size	Magic Theatre	Fri Oct 8 Sat Oct 9 Sun Oct 10	8pm 2:30pm, 8pm 2:30pm	Theater capacity: 162	No
Beatles Fest	Cowell Theater Band Shell	Fri Oct 8 Sat Oct 9	8pm 1pm. 4pm	Theater capacity: 437	No
West Wave	Cowell Theater	Mon Oct 11	8pm	Theater capacity: 437	No
Pinocchio	Young Performers Theatre	Sat Oct 9 Sun Oct 10	1pm, 3:30pm 1pm, 3:30pm	Theater capacity: 100	No
Agile Open 2010	Conference Center	Mon Oct 12 Tue Oct 13	8am-8:30pm 8:30am-5pm		No
Johnnie Walker	Herbst	Wed Oct 13 Thu Oct 14 Fri Oct 15 Sat Oct 16	5:00pm-10pm Nightly	150	No

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Tribal Art Show	Fleet Room	Fri Oct 15 Sat Oct 16 Sun Oct 17	6pm-9pm 11am-7pm 11am-5pm	300	No
BATS Improv	Bayfront Theatre	Fri Oct 15 Sat Oct 16	8pm 8pm	Theater capacity: 200	No
The Brothers Size	Magic Theatre	Fri Oct 15 Sat Oct 16 Sun Oct 17	8pm 8pm 2:30pm	Theater capacity: 162	No
Keep Her Safe	Cowell Theater	Sat Oct 16 Sun Oct 17	8pm 1pm	Theater capacity: 437	No
Title Nine Sale	Herbst Pavilion	Thu Oct 21 Fri Oct 22 Sat Oct 23 Sun Oct 24	9am-9pm	1000 daily	No
SF Open Studios 2006	Conference Center Gatehouse Bldg. C Fleet Room	Fri Oct 22 Sat Oct 23 Sun Oct 24	11am-6pm 11am-6pm	800	No
BATS Improv	Bayfront Theatre	Fri Oct 22 Sat Oct 23	8pm 8pm	Theater capacity: 200	No
Dracula School for Vampires	Young Performers Theatre	Sat Oct 23 Sun Oct 24	1pm 1pm, 3:30pm	Theater capacity: 100	No
LIKHA-Philipino Folk Ensemble	Cowell Theater	Sat Oct 23	2pm, 7pm	Theater capacity: 437	No
E2's 10th Anniversary Celebration & Symposium	Cowell Theater	Thu Oct 28	10am-4:30pm	Theater capacity: 400	No
SF Fall Antiques Show	Festival / Firehouse	Wed Oct 27 Thu Oct 28 Fri Oct 29 Sat Oct 30 Sun Oct 31	7pm-10pm 10am-7pm 10am-7pm 10am-7pm 12pm-6pm	1,000 / gala 1,100 / per day	Valet: Lot E,So .Bldg D & E (wed only) Lot E daily
International Vintage Poster Fair	Conference Cneter	Fri Oct 29 Sat Oct 30 Sun Oct 31	5pm-9pm 10am-7pm 11am-6pm	300 / per day	No
Halloween Party 2010	Herbst Pavilion	Sat Oct 30	8pm-1am	1500	No
Dracula School for Vampires	Young Performers Theatre	Sat Oct 30 Sun Oct 31	1pm 1pm, 3:30pm	Theater capacity: 100	No
BATS Improv	Bayfront Theatre	Sat Oct 30 Sun Oct 31	8pm 8pm	Theater capacity: 200	No

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FORT MASON CENTER
SAN FRANCISCO

Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Forensics Computer Expo	Herbst Pavilion	Mon Nov 1 Tue Nov 2	10am-7pm 10am-7pm	750	No
Food Buzz	Herbst Pavilion	Fri Nov 5	6-9pm	300	No
Practice Fusion Conference	Cowell Theater	Fri Nov 5	10:30am-5:30pm	Theater capacity: 437	No
Off The Grid	FMC Parking Lot	Fri Nov 5	5pm-9pm	800	Main Parking lot front of building C
SF Ski & Snowboard Festival	Festival Pavilion	Sat Nov 6 Sun Nov 7	11am-8pm 11am-6pm	3,000	No
Magic Theatre 0r	Magic Theatre	Sat Nov 6 Sun Nov 7	8pm 2:30pm	Theater capacity: 168	No
Dracula's School For Vampires	Young Performers Theatre	Sat Nov 6 Sun Nov 7	1pm 1pm, 3:30pm	Theater capacity: 100	No
BATS Improv	Bayfront Theatre	Fri Nov 5 Sat Nov 6	8pm 8pm	Theater capacity: 200	No
US Half Marathon San Francisco	Aquatic Park to Marin County	Sun Nov 7	7:00am-10:00am	High Volume	car entrance to FMC could be impacted as walkers pass by
Cowell Theater West Wave	Cowell Theater	Sun Nov 7 Mon Nov 8	8pm-10pm 8pm-10pm	Theater capacity: 437	No
The Global Summit II	Herbst Pavilion	Mon Nov 8 Tue Nov 9 Wed Nov 10	9am-6pm	250	No
Off The Grid	FMC Parking Lot	Fri Nov 12	5pm-9pm	800	Main Parking lot front of building C
Theatre Flamenco: Una Nota Flamenca	Cowell Theater	Fri Nov 12 Sat Nov 13 Sun Nov 14	8pm 8pm 2:00pm	350	No
Dracula's School For Vampires	Young Performers Theatre	Sat Nov 13 Sun Nov 14	1pm 1pm, 3:30pm	Theater capacity: 100	No
Magic Theatre Or	Magic Theatre	Sat Nov 13 Sun Nov 14	2:30pm , 8pm 2:30pm,	Theater capacity: 320	No
BATS Improv	Bayfront Theatre	Sat Nov 13 Sun Nov 14	8pm 8pm	Theater capacity: 200	No
BCBG & Ella Moss Sample Sale	Fleet Room	Sat Nov 13	10-3pm	200	No
Bay Area Brew Fest	Festival Pavilion	Sat Nov 13 Sun Nov 14	1-4pm	1000	No
Fall Luxury Chocolate Salon	Conference Center	Sun Nov 14	10am-5pm	1,000	No
Sencha Users	Herbst Pavilion	Tues Nov 16	4pm-11pm	500	No

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FORT MASON CENTER
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North Face Seminar	Cowell Theater	Tues Nov 16	TBD	Theater capacity: 437	No
Pachamama Luncheon	Festival Pavilion	Wed Nov 17	12-3:30pm	2,000	No
Lines Ballet	Cowell Theater	Wed Nov 17 Thur Nov 18	8pm 8pm	Theater capacity: 437	No
SF Peer Resources Conference	Conference Center C Building Fleet Room	Thu Nov 18	8am-5pm	250	No
Off The Grid	FMC Parking Lot	Fri Nov 19	5pm-9pm	800	Main Parking lot front of building C
BevMo! Holiday Beer Fest	Herbst Pavilion	Sat Nov 20	5:30pm-9pm	1000	No
SF Vitners Market	Festival Pavilion	Sat Nov 20 Sun Nov 21	1pm-5pm public 11am-1pm trade/media	3000	No
Encounters: New Moon Silk Road	Cowell Theater	Sat Nov 20 Sun Nov 21	Sat 8pm Sun 3pm	Theater capacity: 168	No
Magic Theatre Or	Magic Theatre	Sat Nov 20 Sun Nov 21	2:30pm , 8pm 2:30pm,	Theater capacity: 168	No
BATS Improv	Bayfront Theatre	Sat Nov 20 Sun Nov 21	8pm 8pm	Theater capacity: 200	No
SF Birth and Baby Fair	Herbst Pavilion	Sun Nov 21	10-5pm	1,000	No
Celebration of Craftswomen	Herbst Pavilion	Sat Nov 27 Sun Nov 28	10-5pm 10-5pm	900	No
Guardsman Christmas Tree Lot	Festival Pavilion	Sat Nov 27 thru Sun Dec 18	open daily	200	No
Magic Theatre Or	Magic Theatre	Sat Nov 27 Sun Nov 28	2:30pm , 8pm 2:30pm,	Theater capacity: 168	No
BATS Improv	Bayfront Theatre	Sat Nov 27 Sun Nov 28	8pm 8pm	Theater capacity: 200	No
San Francisco Crystal Fair	Conference Center	Sat Nov 27 Sun Nov 28	Sat 10-6pm Sun 10-4pm	100	No

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January 2011

FORT MASON CENTER
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Event Title	Venue Location	Event Days	Event Times	Attendance	Parking Services / Lot Staff
Guardsman Christmas Tree Lot	Festival Pavilion	Sat Nov 27 thru Sun Dec 18	open daily	200	Reserved parking Lot 1 (east of Bldg. E) Sat Dec 4,Sun Dec 5, Sat Dec 11, Sun Dec 12
CCSF Fort Mason Art Campus Student Art Exhibit & Sale	Bldg. B	Fri Dec 3 Sat Dec 4 Sun Dec 5	Fri 6pm-9pm Sat 11:30-5pm Sun 11:30-5pm	100 / day	No
Celebration of Craftswomen	Herbst Pavilion	Sat Dec 4 Sun Dec 5	10am-5pm 10am-5pm	900	No
BATS Improv	Bayfront Theatre	Fri Dec 3 Sat Dec 4	8pm 8pm	Theater capacity: 200	No
Magic Theatre: Or	Magic Theatre	Fri Dec 3 Sat Dec 4 Sun Dec 5	8pm 2:30pm, 8pm 2:30pm	Theater capacity: 162	No
Hi-Ho Silver	Conference Center Marina Room	Fri Dec 3 Sat Dec 4 Sun Dec 5	11-4pm 10am-4pm 11am-4pm	100 / day	No
City Dance Studios Student Performance	Cowell Theater	Sat Dec 4	8pm	250	No
SF Bay Area Metal Clay Guild Holiday Sale	Gatehouse	Sat Dec 4	10am-5pm	200	No
Gilt City SF Warehouse Sale	Fleet Room	Sat Dec 4	10-6pm	300	No
RISD Holiday Arts & Crafts Sales	Conference Center	Sun Dec 5	9:30am-5pm	300	No
Peter Pan	Young Performers Theatre	Sat Dec 4 Sun Dec 5	1pm, 3:30pm 1pm, 3:30pm	Theater capacity: 100	No
Shecky's Girls Night Out	Herbst Pavilion	Thu Dec 9 Fri Dec 10	5-10pm 5-10pm	200	No
Joyful Noise Lorraine Hansberry	Southside Theater	Fri Dec 10 Sat Dec 11 Sun Dec 12	8pm 8pm 4pm	Theater capacity: 168	No
The Nutcracker City Ballet School	Cowell Theater	Sat Dec 11 Sun Dec 12	7pm 2pm, 7pm 2pm, 7pm	400	No
BATS Improv	Bayfront Theatre	Fri Dec 10 Sat Dec 11	8pm 8pm	Theater capacity: 200	No
Bazaar Bizarre	Herbst Pavilion	Sat Dec 11 Sun Dec 12	12pm-10pm 12pm-6pm	Theater capacity: 437	No
Peter Pan	Young Performers Theatre	Sat Dec 11 Sun Dec 12	1pm, 3:30pm 1pm, 3:30pm	Theater capacity: 100	No
25th Annual Tibet Day	Conference Center	Sat Dec 11	11am-10:30pm	300	No

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West Wave	Cowell Theater	Mon Dec 13	8pm	Theater capacity: 437	No
Hi-Ho Silver	Gatehouse	Sat Dec 18 Sun Dec 19	11am-5pm 10am-4pm	100 / day	No
Joyful Noise Lorraine Hansberry	Southside Theater	Fri Dec 17 Sat Dec 18 Sun Dec 19	8pm 8pm 4pm	Theater capacity: 162	No
Yaelisa and Caminos	Cowell Theater	Fri Dec 17 Sat Dec 20 Sun Dec 21	8pm 8pm 2pm	Theater capacity: 437	No
Guardsmen Holiday Party	Festival Pavilion	Sat Dec 18	8pm-2am	1500	No
Peter Pan	Young Performers Theatre	Sat Dec 18 Sun Dec 19 Mon Dec 20 Tues Dec 21	1pm, 3:30pm	Theater capacity: 100	No
Joyful Noise Lorraine Hansberry	Southside Theater	Fri Dec 24 Sun Dec 26	2pm 4pm	Theater capacity: 162	No
BATS Improv New Year's EveSpecial	Bayfront Theatre	Fri Dec 31	8-10pm	Theater capacity: 200	No
Joyful Noise Lorraine Hansberry	Southside Theater	Fri Dec 31	2pm 7pm	Theater capacity: 162	No
San Francisco NYE	Festival Pavilion	Fri Dec 31	9pm-2am	2000	No

JANUARY 2011

PAWS for Laughter Benefit	Southside Theater	Sat Jan !5	8pm-11pm	162	No
Walk for Life	Festival Pavilion	Sat Jan 22	2pm-5:30pm	5,000	No
Good Eats & Zin	Herbst Pavilion	Thur Jan 27	6pm-9pm	1,200	No
ZAP	Festival Herbst Pavilions	Sat Jan 29	2pm-5pm	7,000	No
Fine Print Fair	Conference Center Building A	Fri Jan 28 Sat Jan 29 Sun Jan 30	6pm-9pm 10am-6pm 11am-5pm	300	No

APPENDIX A

Alternatives Considered but Dismissed

Appendix A summarizes the alternatives considered and dismissed from further analysis. It details the alternatives that were developed during the scoping of this project, graphic representations, and the rationale for dismissal. The section concludes with the screening criteria tables.

ALTERNATIVES CONSIDERED AND DISMISSED

In-Street Segment Alternatives Dismissed

Alignment Option 1: Promenade and Beach Street

Description of Alternative. Alignment Alternative Option 1 would use more of the historic State Belt Railroad alignment than any other of the alternatives. See **Figure A-1** for an illustration of the alignment option.

Westbound. This alignment alternative would begin from the existing streetcar tracks at Jefferson Street and Jones Street within the historic State Belt Railroad alignment, and continue westbound on Jefferson Street in a single-track configuration. The alignment option would continue within the historic State Belt Railroad alignment along the Promenade, past the Maritime Museum, through the Fort Mason Tunnel, to a terminal at Fort Mason.

Eastbound. In the eastbound direction, this alignment alternative would travel through the Fort Mason Tunnel, and then transition on the east side of the tunnel from the historic State Belt Railroad alignment at Van Ness Avenue southward to Beach Street via one of the transition segment options, through NPS property, in a single track configuration. Alignment Option 1 would continue east on Beach Street, crossing the Hyde Street cable car line at grade, and then rejoin the existing F-line tracks at Beach Street and Jones Street.

Turnback. A "turnback" track would be included on Leavenworth Street between Jefferson Street and Beach Street, to allow streetcars to turn back in the event of blockage without affecting streetcars at the F-line terminal on Jones Street.

Configuration. Portions of the alternative alignment would be configured to operate either in exclusive or semi-exclusive trackway or in mixed traffic.

Reasons for Dismissal from Further Study. Option 1 was not consistent with park management objectives because it would use the waterfront Promenade for its alignment, thereby creating significant affects to the NHLD by splitting the district and introducing new visual elements to the NHLD, as well as creating streetcar conflict with existing high pedestrian and bicycle traffic on the Promenade. The Promenade/Bay Trail through Aquatic Park is also subject to storm wave over wash. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Alignment Option 2: Victorian Park and Beach Street

Description of Alternative. Alignment Option 2 is similar to Alignment Option 1 as far as Jefferson Street and Hyde Street in the westbound direction (see Figure A-1).

Westbound. At Jefferson Street and Hyde Street, instead of continuing on the Promenade, this alternative alignment would leave the historic State Belt Railroad alignment, turn southward and continue at an angle through Victorian Park, reaching Beach Street approximately mid way between

Source: Wilbur Smith Associates, 2004; NPS

LEGEND

- F Market (existing)
- Fort Mason Extension (proposed)
- Platform (existing)
- Platform (proposed)

ALIGNMENT OPTIONS 1, 2 AND 3

Draft Environmental Impact Statement
Historic Streetcar Extension
San Francisco, California

FIGURE A-1

Larkin Street and Polk Street, where it would turn westward onto Beach Street. From this point, the alignment would be double track on Beach Street. The double track alignment would continue between Beach Street and the east portal of the Fort Mason Tunnel through NPS property parallel to Van Ness Avenue via one of the transition segment options, switching to single track for the Fort Mason Tunnel, and continuing to a terminal at Fort Mason.

Eastbound. In the eastbound direction, the alignment would travel through the Fort Mason Tunnel, and then transition from the historic State Belt Railroad alignment at Van Ness Avenue southward to Beach Street in a double-track configuration via one of the transition segment options. The alignment would continue east on Beach Street, crossing the Hyde Street cable car line at grade, and then rejoin the existing streetcar tracks at Beach Street and Jones Street.

Turnback. A turnback switch would be provided at the point where the westbound track through Victorian Park meets the eastbound track on Beach Street midway between Larkin Street and Polk Street.

Configuration. Portions of the alignment would be configured to operate either in semi-exclusive trackway, or in mixed traffic.

Reasons for Dismissal from Further Study. This option resulted in adverse affects to the National Historic Landmark District, by introducing new visual elements to the NHLD. This alignment did not meet park preservation criteria including: the potential to cause a physical effect on Aquatic Park National Historic Landmark District; potential for visual, noise or other impacts to historic and cultural facilities; and the potential to require the use of parkland for a non-park use since the alignment would cut through Victorian Park. This alternative was ultimately dismissed due to its conflict with the purpose and need of the project.

Alignment Option 4: North Point via Tunnel

Description of Alternative. Alignment Option 4 is a streetcar alternative, see **Figure A-2**. This alignment option would provide more avoidance of the park property than Alignment Options 1, 2 and 3. Additionally, this alignment option differs from Alignment Options 1, 2 and 3 in that it would be configured to operate in both directions on North Point Street between Jones Street and Van Ness Avenue and would operate in the Van Ness Avenue ROW between North Point Street and the tunnel.

Westbound. This alignment option would begin at Jefferson Street and Jones Street, and turn south onto Jones Street, parallel to the existing F-Line terminal track. The track would continue south on Jones Street to North Point Street, and the alignment option then would turn west onto North Point Street. Because of the existing F-line terminal on Jones Street, this alignment option would require two southbound tracks on Jones Street to allow the Fort Mason streetcars to bypass streetcars at the F-line terminal, and because of track geometry limitations. This alignment option would also require two separate station platforms on Jones Street between Jefferson and Beach Streets, because of the parallel tracks. One platform would be for streetcars terminating at Jones Street and would be located at the curbside on the west side of Jones Street. The second platform would be for streetcars continuing through to Fort Mason. This platform would be located towards the middle of Jones Street.

Source: Wilbur Smith Associates, 2004; NPS

LEGEND

- F Market (existing)
- Platform (existing)
- Fort Mason Extension (proposed)
- Platform (proposed)
- 10-Townsend (existing)
- Bus Stop (existing)
- 10-Townsend (proposed)
- Bus Stop (proposed)

ALIGNMENT OPTIONS 4, 4A, AND 5

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FIGURE A-2

The alignment option would then curve west onto North Point Street. The alignment then would continue in a double track configuration on North Point Street to Van Ness Avenue, where the alignment would turn north on Van Ness Avenue. The alignment along Van Ness Avenue switches to single track close to the tunnel portal, and continues through the tunnel to a terminal at Fort Mason.

Eastbound. From the terminal at Fort Mason, this alignment option would begin as single track through the tunnel, then switch, double track east of the tunnel portal and would use the same path travelling westbound as far as Jones Street and Beach Street, where the eastbound track turns east onto Beach Street to rejoin the existing streetcar tracks. Portions of the alignment that are in public street ROW could be configured to operate either in semi-exclusive trackway, or in mixed traffic.

Reasons for Dismissal from Further Study. The San Francisco MTA Office of Health and Safety requested the elimination of Alignment Option 4: North Point via Tunnel from further consideration. San Francisco MTA stated that operation of the historic streetcar on Van Ness Avenue between North Point Street and the Fort Mason Tunnel would be "unacceptably hazardous" for a number of reasons, including conflicts with bicycle traffic and other transit operations, historic streetcar capability with regard to street grade, special trackwork and trackwork curvature, loading platforms and operating in mixed traffic (SFMTA 2006). This alternative was ultimately dismissed due to infeasibility.

Alignment Option 4A: North Point via Bay

Description of Alternative. Alignment Option 4A is a streetcar alternative that responds to a comment card submitted at the May 9, 2006 Public Scoping Meeting that suggested using Bay Street in order to minimize impacts to parkland (see Figure A-2). It is similar to Alignment Option 4 as far as North Point Street and Van Ness Avenue, but differs in that it would not use the Fort Mason Tunnel between Van Ness Avenue and Fort Mason, but instead would use Bay Street.

Westbound. This alignment alternative is the same alignment as Alignment Option 4 east of Van Ness Avenue (as described above). From North Point Street and Van Ness Avenue the double track alignment would turn south on Van Ness Avenue to Bay Street, west on Bay Street to Laguna Street, north on Laguna Street to Marina Boulevard, to a terminal at Fort Mason.

Eastbound. This alignment option would be double track in configuration, therefore in the eastbound direction, this alignment would use the same path travelling westbound as far as Jones Street and Beach Street, where the eastbound track would then turn east onto Beach Street to rejoin the existing F-Line streetcar tracks. Portions of the alignment that are in public street ROW would be configured to operate either in semi-exclusive trackway, or in mixed traffic.

Reasons for Dismissal from Further Study. This alternative received a very low rating for operability. This alternative posed potential for conflict with major bike or pedestrian flows, and did not directly serve NPS facilities. There was also concern with streetcars stacking up at Jones Street before continuing on to Fort Mason Center. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Alignment Option 5: Motor Coach via Bay

Description of Alternative. Alignment Option 5 is a motor coach alternative that would be an extension of the current Muni 10-Townsend local bus line (see Figure A-2). The 10-Townsend currently operates from the Caltrain Terminal to North Point Street and Van Ness Avenue via Transbay Terminal, and the Sansome/Battery couplet. The buses operate on North Point Street from the Embarcadero to Van Ness Avenue, and terminate on Van Ness Avenue north of North Point Street.

Westbound. This alignment would extend the westbound (inbound) 10-Townsend via Van Ness Avenue, Bay Street and Buchanan Street to Fort Mason.

Eastbound. In the eastbound direction, the alignment option would travel from Fort Mason onto Marina Boulevard, Laguna Street, Bay Street, Van Ness Avenue, and rejoin the existing 10-Townsend route at Van Ness Avenue and North Point Street.

Reasons for Dismissal from Further Study. Option 5 was dismissed during the initial stages of the Feasibility Study because it did not respond to the purpose of the project of providing a mass transit rail connection. This alternative scored low in the alternatives screening for its ability to connect NPS sites directly to traffic generators along the northern waterfront cultural and recreation corridor and would not connect directly to the current historic streetcar. The motor coach alternatives would also be associated with higher air quality impacts which made this alternative less desirable. Another concern with the 10-Townsend is that its schedule is more limited than the F-line, it ends service at 8:00 p.m. There was also a concern that expanding service on the 10-Townsend to match F-Line service would be too costly because transfers from the F-line to the 10 required out of direction movement that would cause drops in ridership and many tourists would not know where to go to make this transfer. Lastly, SFMTA's Transit Effectiveness Project recommendations propose discontinuing the 10-Townsend in the future. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Alignment Option 5A: Motor Coach via Tunnel

Description of Alternative. Alignment Option 5A is a motor coach alternative that would be an extension of the current 10-Townsend local bus line from the current terminal at Van Ness Avenue and North Point Street, similar to Alignment Option 5, except that if would operate via the Fort Mason Tunnel between Van Ness Avenue and Fort Mason instead of Bay Street. **Figure A-3** illustrates Alignment Option 5A. This alignment option would require the installation of two special systems – the first would be a ventilation system in the tunnel that could evacuate the motor coach exhaust to a safe level and maintain the air quality. The second would be a signal system that would control access to the tunnel for buses so that only buses going in one direction could enter the tunnel at a time, and also provide spacing between buses in the same direction. This type of signaling system is common in rail applications, but is not a standard item for motor coach operations.

Westbound. This alternative would extend the westbound (inbound) 10-Townsend via Van Ness Avenue continuing northward and through the Fort Mason tunnel, terminating at Fort Mason.

Eastbound. In the eastbound direction, the alignment option would be configured to operate in the reverse of the westbound route, as described above.

Source: Wilbur Smith Associates, 2004; NPS

LEGEND

10-Townsend (existing)	F Market (existing)
Bus Stop (existing)	Platform (existing)
10-Townsend (proposed)	New Trolley Coach Line
Bus Stop (proposed)	Bus Stop (proposed)

ALIGNMENT OPTIONS 5A, 6, AND 6A

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FIGURE A-3

Reasons for Dismissal from Further Study. This alternative was rated low in the alternatives screening for its ability to connect NPS sites directly to traffic generators along the northern waterfront cultural and recreation corridor and would not connect directly to the current historic streetcar. This alternative was also rated low for operability. Another concern with the 10-Townsend is that it ends service at 8:00 p.m. Lastly, SFMTA's Transit Effectiveness Project recommendations propose discontinuing the 10-Townsend in the future. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Alignment Option 6: Trolley Coach via Tunnel

Description of Alternative. Alignment Option 6 is a trolley coach alternative that consists of a new trolley coach line connecting to the current F-line at Jones Street and Beach Street, see Figure A-3. This alignment option requires the construction of new overhead trolley coach wire, except where the alignment uses existing trolley coach wire on North Point Street between Columbus Avenue and Van Ness Avenue. Like the Alignment Option 5A, this alignment option would also require a signal system that would control access to the tunnel for buses so that only buses going in one direction could enter the tunnel at a time, and also provide spacing between buses in the same direction.

Westbound. In the westbound direction, the line would operate from the current terminal of the F-line at Jones and Beach Streets via Jones Street, Jefferson Street, Leavenworth Street, North Point Street, and Van Ness Avenue to the Fort Mason Tunnel, and then to a terminal at Fort Mason.

Eastbound. In the eastbound direction, the line would operate the reverse of the westbound route (described above) to North Point Street and Leavenworth Street, and then continue on North Point Street to Jones Street, then via Jones Street to the terminal at Beach Street.

Reasons for Dismissal from Further Study. This alternative did not meet the purpose of the project of providing a mass transit rail connection. It did not meet the purpose and need criteria for its ability to connect NPS sites directly to traffic generators along the northern waterfront cultural and recreation corridor and it does not connect directly to the current historic streetcar, nor would it increase ridership to NPS sites or improve connectivity for transit-dependent residents. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Alignment Option 6A: Trolley Coach via Bay

Description of Alternative. Alignment Option 6A is a trolley coach alignment that consists of a new trolley coach line connecting to the current F-line, see Figure A-3.

Westbound. This alignment option is similar to Alignment Option 6 east of Van Ness Avenue, but reaches Fort Mason via Van Ness Avenue, Bay Street, Buchanan Street and Marina Boulevard instead of via the Fort Mason Tunnel.

Eastbound. In the eastbound direction, it would operate via Marina Boulevard, Laguna Street, Bay Street, Van Ness Avenue, and rejoin the existing route at Van Ness Avenue via North Point Street to Jones Street, then via Jones Street to a terminal at Beach Street.

Reasons for Dismissal from Further Study. This alternative did not meet the purpose and need criteria for its ability to connect NPS sites directly to traffic generators along the northern waterfront cultural and recreation corridor and it does not connect directly to the current historic streetcar, nor would it increase ridership to NPS sites or improve connectivity for transit-dependent residents. This alternative was ultimately dismissed due to its conflict with the purpose and need of the project.

Transition Segment Alternatives Dismissed

In-street segments 1 and 2 require traversing NPS property between approximately Beach and Polk Streets and the Van Ness Avenue portal of the Fort Mason Tunnel, in an area known as the "transition."

Transition Segment #E-3A (1)

Description of Alternative. Transition Segment Option #E-3A(1) would stretch from the Fort Mason tunnel east portal to Polk Street in an inverted S-curve shape. The design proposes a double-track alignment with an interlocked track at the entrance to the Fort Mason tunnel (**Figure A-4**). This option would accommodate a dual-side platform station, which would be located parallel to the existing retaining wall on the Van Ness Avenue. The existing retaining wall would not be impacted due to the placement of the platforms and the alignment, (unlike Transition Segment Option #2), however some modifications might be necessary. Under this alignment, the existing bocce court on NPS property (at the western end of Beach Street) would have to be removed and relocated to accommodate the streetcar tracks.

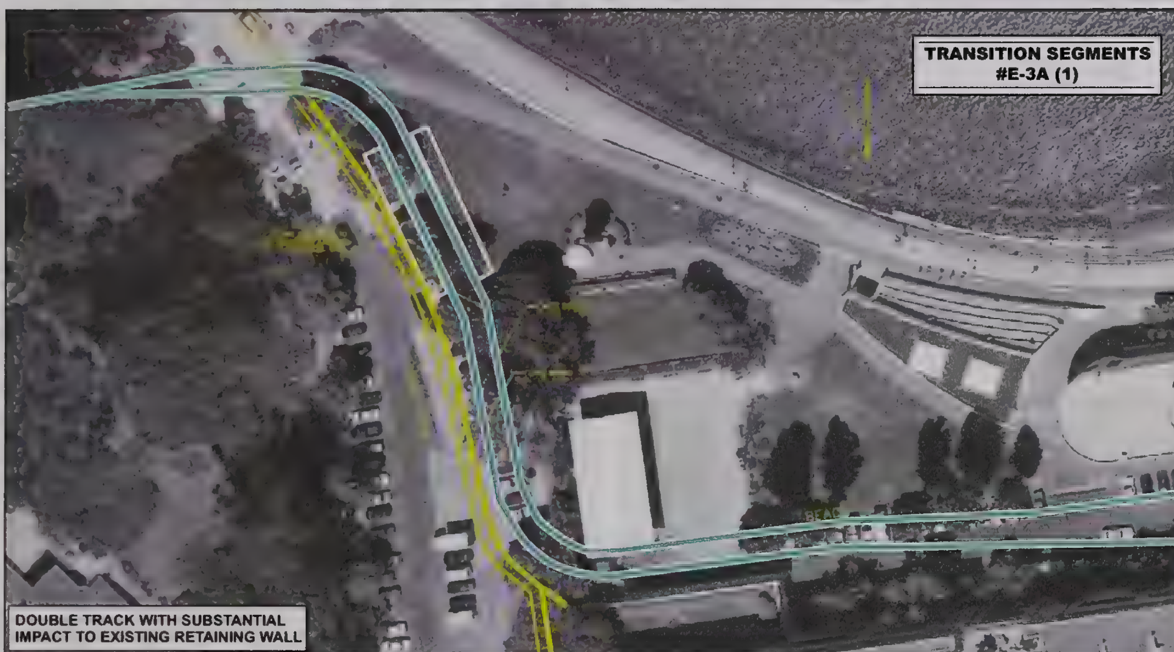
Reasons for Dismissal from Further Study. The transition segment #E-3A (1), developed for the Feasibility Study, was refined in consultation with the project's TAC and other stakeholders. Transition Segment #E-3A (1) and Transition Segment #E-3A(2) were combined, renamed the Transition Segment Area and are now part of the proposed project.

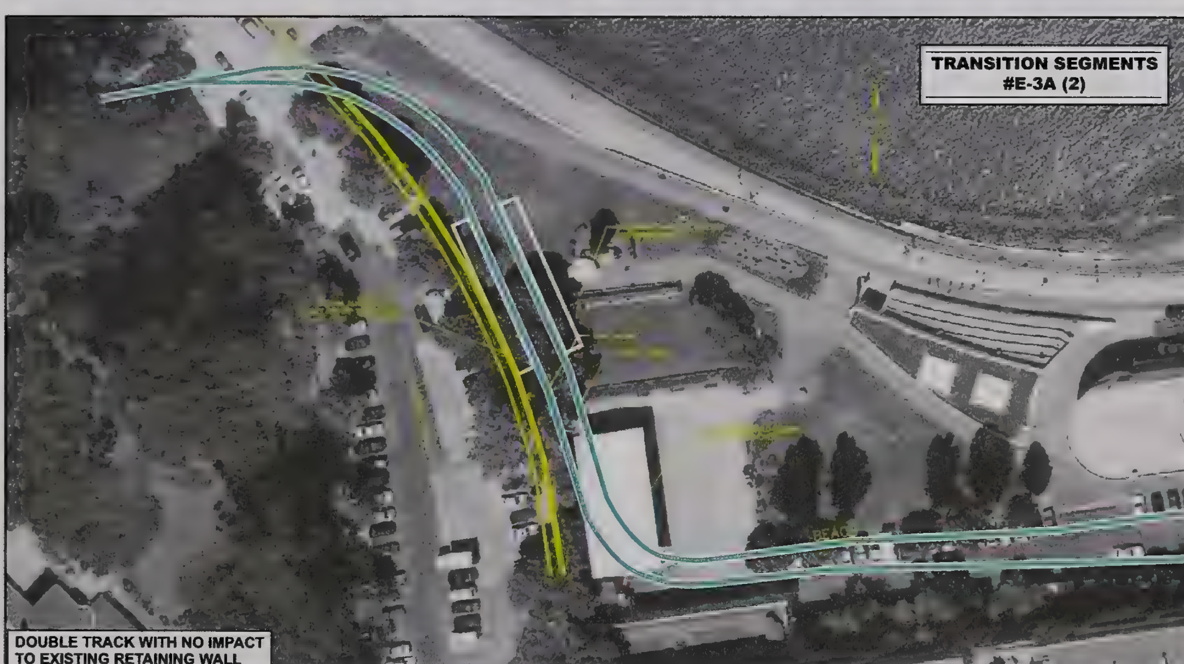
Transition Segment #E-3A (2)

Description of Alternative. Transition Segment Option #E-3A(2) would stretch from the Fort Mason tunnel east portal to Polk Street in an inverted S-curve shape. The design proposes a double-track alignment with an interlocked track at the entrance to the Fort Mason tunnel, similar to Option 1 (Figure A-4). This option would accommodate a dual-side platform station, which would be located parallel to the existing retaining wall on Van Ness Avenue, north of Option 1 platforms. The existing retaining wall would be substantially impacted due to the platform and alignment design, compared to Transition Segment Option #2. However, the existing bocce court on NPS property (at the western end of Beach Street) would not be removed and relocated.

Reasons for Dismissal from Further Study. The transition segment #E-3A (2), developed for the Feasibility Study, was refined in consultation with the project's TAC and other stakeholders. Transition Segment #E-3A (1) and Transition Segment #E-3A(2) were combined, renamed the Transition Segment Area and are now part of the proposed project.

Aquatic Park Transition Segment B2





Source: NPS

TRANSITION SEGMENTS

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FIGURE A-4

Development of Alternative. This alternative was developed following revisions to the #E-3A (1) and (2). California Public Utilities Commission (CPUC) regulations precluded locating the switch (the transition between double tracks and single tracks) in the sidewalk area due to the high volume of bikes in the area. SFMTA staff suggested that the optimal location would be on the east side of Van Ness Avenue not in the street ROW or in the sidewalk area. SFMTA staff recommended that the westbound platform near Van Ness Avenue be moved to the far side of the walkway so that the platform would be closer to the end of the double track. The NPS preferred to transition the single track east of Van Ness Avenue to avoid intersecting the Bay Trail.

Reasons for Dismissal from Further Study. The Transition Option B2 design located the switch on the west side of Van Ness Avenue, the westbound platform was sited inside the contributing area of the Aquatic Park NHLD and the tracks intersected with the Bay Trail creating such unsafe conditions for pedestrians and bicycles that a detour of the bay trail was required. Option B2 was not promoted by members of the public or agencies. It did not conform to SFMTA or San Francisco Maritime NHP management objectives and was not supported by the TAC for technical reasons.

Turnaround Segment Alternatives Dismissed

Turnaround Option 1: Fort Mason Loop

Description of Alternative. The turnaround option, as shown on **Figure A-5**, would be in the Fort Mason Center parking lot, east of the Fort Mason gates. The turnaround option would operate in a counter-clockwise loop and would bisect the parking control gates as well as cross over the historic trackwork (known as the Ladder Tracks). The turnaround option would have a minimal footprint, in comparison to Turnaround Option 2 and would include a spur track for layovers and storage. The turnaround option includes two platforms: a boarding platform to the east of the storage track, which would be sized for one streetcar, and a passenger drop-off platform on the eastern side of the loop which could accommodate two streetcars.

Reasons for Dismissal from Further Study. This alternative presented potential for conflict with automobiles, bicycle or pedestrian flows and had the potential to affect existing park facilities and operations. It was also vulnerable to delay and had potential for interference with traffic flow/patterns in an already congested area. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Turnaround Option 2: Fort Mason Short Loop

Description of Alternative. The turnaround option, shown on Figure A-5, would be a counter-clockwise loop and would begin in the Great Meadow. The turnaround option would travel through the Fort Mason parking lot, to the south of the Guard House, cross the Laguna Street and Beach Street intersection. The tracks would angle northwest through the Yacht Harbor parking lot, where a westbound platform and spur would be provided for streetcar storage. The platform would be two streetcars in length. At the Buchanan Street and Beach Street intersection the turnaround option would turn south to turn into eastbound Beach Street. A second platform would be north of the Safeway parking lot. This turnaround option would have a larger footprint than Turnaround Option 1, and a portion of the option would be on non-National Park Service properties.

TURNAROUND OPTION 1: FORT MASON LOOP

TURNAROUND OPTION 2: FORT MASON SHORT LOOP

TURNAROUND OPTION 4: EAST-WEST LOOP

TURNAROUND OPTION 5: NORTH WYE

TURNAROUND OPTION 6: NORTH WYE - TWO TRACKS

TURNAROUND OPTIONS 1, 2, 4, 5, AND 6

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FIGURE A-5

Reasons for Dismissal from Further Study. This option lacks an outbound drop off platform and a layover area. This alternative was ultimately dismissed due to operational concerns.

Turnaround Option 4: East-West Loop

Description of Alternative. The turnaround option consists of a large counter-clockwise loop within Fort Mason Center parking lot on NPS property, as shown on Figure A-5. The turnaround option would have one platform and a storage track, which would extend to Laguna Street on the historic State Belt Railroad alignment. In contrast to most of the other turnaround options, the platform would be oriented east-west instead of north-south.

Reasons for Dismissal from Further Study. This alternative was rated low because of technical problems and failure to meet park management objectives because of high potential for visual, noise, or other adverse impacts on NHLD; potential for conflict with automobile, bicycles or pedestrian flow; and the utility of turnaround track after extension. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Turnaround Option 5: North Wye

Description of Alternative. This turnaround option is named for its ("wye") shaped track north of the main running track, as shown in Figure A-5. The turnaround option would be in the Fort Mason gates on NPS property, and has a minimal footprint that would avoid the historic ladder tracks, but would offer no storage capability. There would be two platforms – one on the historic State Belt Railroad alignment close to Laguna Street for boarding and the other south of the historic ladder tracks for alighting.

Reasons for Dismissal from Further Study. This alternative was eliminated from further consideration because the "wye" turnaround options do not meet SFMTA's operational requirements. Adequate car capacity was a concern with this alternative. Additionally, compared to the terminal loop options, the "wye" configurations would have higher costs associated with the track switch maintenance, and require the streetcars to move through the switches six times (versus two times with a loop option). The increase in movements through the switches would also increase the probability for track switch failure or overhead contact system failure (SFMTA 2009b). This alternative also lacks layover or storage tracks. This alternative was ultimately dismissed due to infeasibility.

Turnaround Option 6: North Wye – Two Tracks

Description of Alternative. This turnaround option is named for its "wye" shaped track north of the main running track, and additional storage track to the south, as shown on Figure A-5. The turnaround option would be in NPS property and would avoid the historic ladder tracks. There would be three platforms associated with this turnaround option: one on the historic State Belt Railroad alignment, adjacent to Laguna Street for boarding, one south of the historic State Belt Railroad alignment, adjacent to Laguna Street for boarding, and one on the northern tip of the "wye" shaped track for alighting. The existing retaining wall on the southern side will need to be moved to accommodate the third track. The turnaround option would require a retaining wall and additional earth-moving activities to accommodate the second track. This option differs from Turnaround Option 5 in that it would allow for an extra car at the terminal.

Reasons for Dismissal from Further Study. This alternative was eliminated from further consideration because the "wye" turnaround options do not meet SFMTA's operational requirements. Additionally, compared to the terminal loop options, the "wye" configurations would have higher costs associated with the track switch maintenance, and require the streetcars to move through the switches six times (versus two times with a loop option). The increase in movements through the switches would also increase the probability for track switch failure or overhead contact system failure (SFMTA 2009b). This alternative was ultimately dismissed due to infeasibility.

Turnaround Option 7: South Wye

Description of Alternative. This turnaround option is named for its "wye" shaped track to the south of the main running track, as shown on **Figure A-6**. The turnaround option would be on NPS property and would not have a storage track. There would be two platforms, one on the historic State Belt Railroad alignment adjacent to Laguna Street for alighting, the other would be on the southern tip of the "wye" shaped track for boarding. This option would require a curved retaining wall across the existing Bay Trail. Considerable earth moving and grade change would be required.

Reasons for Dismissal from Further Study. This alternative was eliminated from further consideration because the "wye" turnaround options do not meet SFMTA's operational requirements. Additionally, compared to the terminal loop options, the "wye" configurations would have higher costs associated with the track switch maintenance, and require the streetcars to move through the switches six times (versus two times with a loop option). The increase in movements through the switches would also increase the probability for track switch failure or overhead contact system failure (SFMTA 2009b). This option also lacks a layover area, storage tracks, and does not have enough room if a car needed to be towed. This alternative was ultimately dismissed due to infeasibility.

Turnaround Option 9: Fort Mason Gate Loop

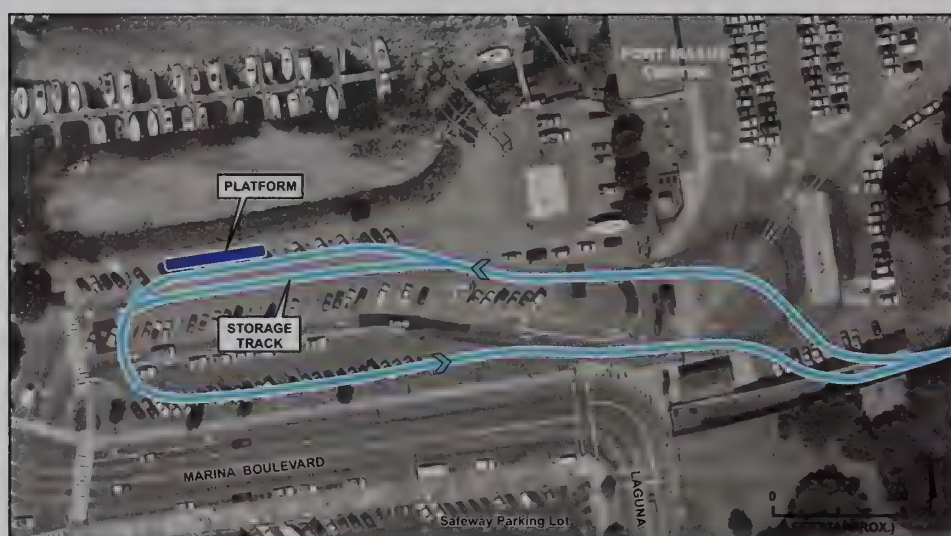
Description of Alternative. This turnaround option is a counter-clockwise loop using the Gas House Cove parking lot for both directions and going through the Fort Mason gates, as shown on Figure A-6. This turnaround option would not be on NPS property but would offer storage capability for a streetcar through a double-track design on the northern side of the loop. There would be one platform on the northern side of the loop for boarding and alighting.

Reasons for Dismissal from Further Study. This alternative was rated low for failing to meet the following park management criteria: sensitivity of resources; potential for conflict with automobile, bicycle or pedestrian flows; affect on existing park facilities and operations. In addition it was rated low for loss of parking as it would cut through a large section of parking spaces at Fort Mason and public safety. This option is lacking a second platform for loading or needs a layover area. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Turnaround Option 10: Safeway Loop

Description of Alternative. This turnaround is a clockwise loop around the Safeway block within city street ROWs (Laguna Street, North Point Street, Buchanan Street, and Marina Boulevard), as shown on Figure A-6. This turnaround option does not include a storage track. Two platforms would be on

TURNAROUND OPTION 7: SOUTH WYE



TURNAROUND OPTION 9: FORT MASON GATE LOOP

TURNAROUND OPTION 10: SAFEWAY LOOP

TURNAROUND OPTIONS 7, 9, AND 10

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FIGURE A-6

the NPS property on the historic State Belt Railroad alignment, adjacent to Laguna Street. This option would require the installation of a rail-to-rail crossing at the intersection of Marina Boulevard and Laguna Street.

Reasons for Dismissal from Further Study. This option did not provide direct access to Fort Mason. Potential problems with this alternative included traffic delays caused by Safeway delivery trucks on North Point Street behind Safeway and by mail delivery trucks blocking Buchanan Street. This alternative was dismissed based on a low rating in the screening process. This option lacks storage tracks. This alternative was ultimately dismissed due to both infeasibility and its conflict with the purpose and need of the project.

Turnaround Option 11: Marina Loop

Description of Alternative. This turnaround option was initially presented at the public scoping meeting as Turnaround Option 2. The turnaround option would be a counter-clockwise loop using Gas House Cove parking lot (outbound), with inbound track on south side of Marina Boulevard (**Figure A-7**). The turnaround option would include a double track storage track on the northern side of the loop. There would be two platforms – one on the northern side of the loop and one on the south side of the loop near the corner of Marina Boulevard and Laguna Street. This design option would require the installation of switches and rail to rail crossings at the intersection of Marina Boulevard and Laguna Street; it would also require a signal at the intersection of Marina Boulevard and Buchanan Street, for the streetcars to exit the Gas House Cove parking lot.

Reasons for Dismissal from Further Study. This alternative was dismissed based on a low rating because it failed to meet park management objectives. This option resulted in adverse affects to the National Historic Landmark District, by introducing new visual elements to the NHLD. This alternative also had public safety concerns, loss of parking and low public support. This alternative was ultimately dismissed due to its conflict with the purpose and need of the project.

Turnaround Option 12: Small Marina Loop

Description of Alternative. This turnaround option is a clockwise loop that would use the northern side of Marina Boulevard for outbound direction, with a loop in Gas House Cove parking lot, as shown on Figure A-7. This turnaround option would not be on NPS property. A storage track would be to the north of the platform. The turnaround option would require the installation of switches at the intersection of Marina Boulevard and Laguna Street, and would require streetcars to run reverse to the street traffic on Marina Boulevard for a short segment, protected by all-way red signals.

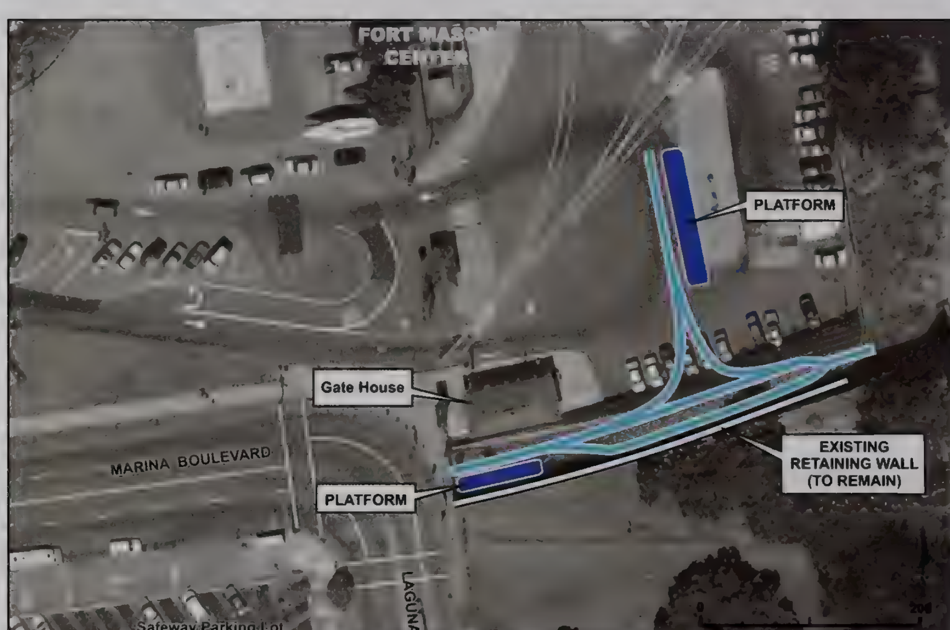
Reasons for Dismissal from Further Study. This alternative received a low rating in the screening process. This alternative also had public safety concerns, loss of parking and low public support. In addition, having only one platform in this option presents a problem with streetcar layover. This alternative was ultimately dismissed due to its conflict with the purpose and need of the project.

Fort Mason Turnaround: Modified North Wye – Two Tracks – Option RL

Description of Alternative. This turnaround option is a slightly modified version of Turnaround Option 6: North Wye – Two Tracks (see Figure A-7). The turnaround option would be a "wye" shaped track to the north of running track, with a separate double-sided runaround or storage track to the

TURNAROUND OPTION 11: MARINA LOOP

TURNAROUND OPTION 12: SMALL MARINA LOOP



TURNAROUND OPTION RL: MODIFIED NORTH WYE - TWO TRACKS

TURNAROUND OPTIONS 11, 12, AND RL

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FIGURE A-7

south of the main track. Compared to Turnaround Option 6, the retaining wall would be in a different location stretching south of the tracks. The platform configuration for this turnaround option is less confusing for passengers than Turnaround Option 6. This turnaround option would be on NPS property and designed to avoid the historic ladder tracks. It requires some earth-moving to expand the ROW to accommodate a second track. It could also affect the Bay Trail.

Reasons for Dismissal from Further Study. This alternative was eliminated from further consideration because the "wye" turnaround options do not meet SFMTA's operational requirements. Additionally, compared to the terminal loop options, the "wye" configurations would have higher costs associated with the track switch maintenance, and require the streetcars to move through the switches six times (versus two times with a loop option). The increase in movements through the switches would also increase the probability for track switch failure or overhead contact system failure (SFMTA 2009b). This alternative was ultimately dismissed due to infeasibility.

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#	Category	Criteria	Measurement	Comment	Option 1 - Promenade Beach	Option 2 - Vict Park Beach	Option 3 - Beach 2-Way	Option 4 - No Pt to Tunnel	Option 4A - No Pt to Bay	Option 5 - Motor Coach via Bay	Option 5A - Motor Coach via Tunnel	Option 6 - Trolley Coach via Tunnel	Option 6A - Trolley Coach via Bay	Comment
Graded Criteria														
1	Purpose and Need	Connect NPS sites directly to traffic generators along Northern Waterfront Cultural and Recreational Corridor	Directly connect NPS sites (Alcatraz Boats, Hyde Street Pier, Argonaut Hotel/Visitor Center, Maritime Museum, Aquatic Park, Municipal Pier, Fort Mason Center) with following traffic generators within ½ block of alignment - AT&T Park, Pier 40 Watersports Center, Ferry Building, Pier 7, Pier 27-31, Pier 39, Tour Boats, Cable Cars	High/Medium/Low	● 3	● 3	● 3	○ 2	○ 1	○ 1	○ 1	○ 1	○ 1	
2	Purpose and Need	Potential ridership increase	Potential for increased ridership to NPS sites	High/Medium/Low	● 3	● 3	● 3	● 3	● 3	○ 2	○ 2	○ 1	○ 1	
3	Purpose and Need	Connectivity with regional transit services	Number of regional transit connections within ½ block of alignment - Caltrain Terminal, Ferry Building, BART, Transbay Terminal	High (3), Med (2), Low (1)	● 3	● 3	● 3	● 3	● 3	● 3	● 3	○ 1	○ 1	
4	Purpose and Need	Improved connectivity for transit-dependent residents	Number of Muni lines connected to Northern Waterfront with one transfer	High (30+ lines), Medium (20-30), Low (Less than 20)	● 3	● 3	● 3	● 3	● 3	● 3	● 3	○ 1	○ 1	
5	Purpose and Need	Historic Infrastructure	Project incorporates historic rail infrastructure	High/Low	● 3	● 3	● 3	● 3	○ 1	○ 1	● 3	● 3	○ 1	Wording modified to address SFCTA issue
6	Purpose and Need	Local transit access	Project provides enhanced local transit access for residents to downtown	High/Medium/Low	○ 2	○ 2	○ 2	○ 2	● 3	● 3	○ 2	○ 1	○ 1	Added to address SFCTA comment
7	Purpose and Need	Connectivity with current historic streetcar service	Transfers required to access F-line	High/Low	● 3	● 3	● 3	● 3	● 3	○ 1	○ 1	○ 1	○ 1	
	Purpose and Need	Subtotal		Score	20	20	20	19	17	14	15	9	7	
				Total Possible	21	21	21	21	21	21	21	21	21	
				Percent	95%	95%	95%	90%	81%	67%	71%	43%	33%	
8	Park Preservation	Impact on NHL Resources	Potential to cause a physical effect on Aquatic Park National Historic Landmark District	High/Medium/Low	○ 1	○ 1	○ 1	● 3	● 3	● 3	● 3	● 3	● 3	Added to address NPS/SFMNHP comment
9	Park Preservation	Impact on the existing historic and cultural setting	Potential for visual, noise or other impacts on historic and cultural facilities	High/Medium/Low	○ 1	○ 1	○ 1	○ 2	● 3	● 3	○ 1	○ 2	● 3	
10	Park Preservation	4-F impact	Potential to require the use of parkland for a non-park use	High/Medium/Low	○ 1	○ 1	○ 2	● 3	● 3	● 3	○ 2	○ 2	● 3	
11	Park Preservation	Access to NPS facilities	Project directly serves NPS sites with no barriers or grades for elderly/disabled access	High/Medium/Low	● 3	● 3	● 3	● 3	○ 1	○ 1	○ 2	○ 2	○ 1	
12	Park Preservation	Bike and Pedestrian Impacts	Potential for conflict with major bike or pedestrian flows	High/Medium/Low	○ 1	○ 1	○ 2	○ 2	○ 1	● 3	○ 2	○ 2	● 3	
13	Park Preservation	Minimize air quality impacts	Operates with electrically-powered vehicles or other zero-emission vehicles	High/Low	● 3	● 3	● 3	● 3	● 3	○ 1	○ 1	● 3	● 3	
	Park Preservation	Subtotal		Score	10	10	12	16	14	14	11	14	16	
				Total Possible	18	18	18	18	18	18	18	18	18	
				Percent	56%	56%	67%	89%	78%	78%	61%	78%	89%	
14	Operability	Engineering - Street grade	Grades between 6% and 9% not desirable for rail. Grades between 3% and 6% more desirable. Grades less than 3% most desirable	High/Medium/Low	○ 2	○ 2	○ 2	○ 1	○ 1					
15	Operability	Engineering - Curves and Specialwork	Complex trackwork not desirable. Specialwork on steep grades not desirable. Curves on steep grades not desirable	High/Medium/Low	● 3	● 3	○ 2	○ 1	○ 1					
16	Operability	Maximize separate right-of-way for transit	Measurement of mileage operating in a separate off-street right-of-way	High – 50% or more, Medium 25-50%, Low - less than 25% in PRW	● 3	● 3	○ 2	○ 2	○ 1	○ 1	● 3	○ 2	○ 1	
17	Operability	Arterial traffic	Ability to create reserved ROW within street ROW for separation from arterial traffic	High/Medium/Low	● 3	● 3	○ 2	○ 1	○ 1	○ 1	○ 1	○ 1	○ 1	
18	Operability	Minimize operating cost impacts	Estimated incremental additional operating cost for each alternative over current system	High/Medium/Low	● 3	● 3	● 3	○ 2	○ 1	○ 1	○ 1	○ 1	○ 1	
19	Operability	Service design	Adheres to Muni Service Planning guidelines - fits in overall route network structure, straight line routes, minimize use of single-purpose shuttles, both directions same location	High/Medium/Low	○ 2	○ 2	● 3	○ 1	○ 1	● 3	○ 2	○ 1	○ 1	
20	Operability	Legibility of service structure	Minimize out of direction travel	High/Medium/Low	● 3	● 3	● 3	○ 1	○ 1	● 3	○ 2	○ 1	○ 1	
21	Operability	Conflict with other transit operations	Minimize conflicts with other transit modes, operations and terminals. Minimize necessity to move other transit operations to accommodate project	High/Medium/Low	● 3	● 3	○ 2	○ 1	○ 1	○ 2	○ 2	○ 1	○ 1	
22	Operability	Surface operational safety	Surface operational safety is not compromised by any operating condition, or combination of conditions	High/Medium/Low	○ 2	○ 2	● 3	○ 1	○ 2	● 3	● 3	● 3	● 3	Added to address Muni comment
23	Operability	Tunnel Operational Safety	Secure method for controlling operation in tunnel and restricting non-transit vehicle access into tunnel	High/Medium/Low	● 3	● 3	● 3	● 3			○ 1	○ 2		
	Operability	Subtotal		Score	27	27	25	14	10	14	15	12	9	
				Total Possible	30	30	30	30	27	21	24	24	21	
				Percent	90%	90%	83%	47%	37%	67%	63%	50%	43%	
	TOTAL			Score	57	57	57	49	41	42	41	35	32	
				Total Possible	69	69	69	69	66	60	63	63	60	
				Percent	83%	83%	83%	71%	62%	70%	65%	56%	53%	

HISTORIC STREETCAR EXTENSION EIS
Preliminary Screening of Terminal Alternatives
July 11, 2007

Maximum score / criterion = 5

Estimated quantitative or un-measured ratings

SCREENING CRITERIA FOR TERMINAL OPTIONS					Within Fort Mason gates						Within NPS property			Other				
					1	2	3	4	5	RL	6	7	8	10	11	12	13	
#	Category	Criterion	Measurement	Range	Fort Mason Loop	Fort Mason Short Loop	Bldg A Loop	East-West Loop	North Wye	Modified North Wye: 2 tracks	North Wye: 2 tracks	South Wye	Great Meadow Loop	F Mason Gate Loop	Safeway Loop	Marina Loop	Small Marina Loop	Comments
PURPOSE AND NEED : ***Criteria relating to the established Need and Purpose for the project***																		
1	Purpose and Need	Potential ridership increase	Potential for increased ridership to SAFR and GGNRA	1 = Low potential 5 = High potential	4	4	5	5	4	4	4	3	3	2	2	2	2	
2	Purpose and Need	Local transit access	Project provides enhanced local transit access for residents	1 = Poor access 5 = High access	3	3	3	3	3	4	4	4	4	4	5	4	4	
3	Purpose and Need	Fort Mason access	Provides direct access for visitors, residents, and employers at/to Fort Mason Center, regardless of personal physical mobility	1 = Poor access 5 = High access	4	4	5	5	3	3	3	2	2	2	1	2	2	
		Subtotal:	**PURPOSE AND NEED**	Score	11	11	13	13	10	11	11	9	9	8	8	8	8	
				Total Possible	15	15	15	15	15	15	15	15	15	15	15	15	15	
				Percent	73%	73%	87%	87%	67%	73%	73%	60%	60%	53%	53%	53%	53%	
COMPATIBILITY WITH PARK ACTIVITIES AND RESOURCES : ***Criteria relating to the various objectives of the National Park Service in owning and operating the national parks through which this project passes***																		
4	Park Preservation	NHPA Section 106	Potential for visual, noise, or other adverse impacts on NHLD	1 = High impact 5 = Minimal impact	3	2	1	1	3	3	2	5	5	3	4	4	4	
5	Park Preservation	US DOT Section 4F	Potential for harm to recreational resources	1 = High impact 5 = Minimal impact	4	4	4	4	4	4	4	2	1	3	5	3	3	[illegible]
6	Park Preservation	US DOT Section 4F	Sensitivity of resources	1 = High sensitivity 5 = Minimal sensitivity	4	4	3	3	4	4	4	2	2	1	5	3	3	[illegible]
7	Park Preservation	US DOT Section 4F	Alteration of physical boundaries that define the edges of the NHLD	1 = High impact 5 = Minimal impact	5	5	5	5	4	3	3	1	1	4	5	5	5	
8	Park Preservation	Bike and ped impacts	Potential for conflict with automobile, bicycle or pedestrian flows	1 = High impact 5 = Minimal impact	1	2	1	1	3	3	3	1	1	1	1	1	1	
9	Park Preservation	Park facilities impacts	Affects existing park facilities and operations (GGNRA)	1 = High impact 5 = Minimal impact	1	2	1	1	4	4	4	4	4	1	5	3	2	
		Subtotal:	**COMPATIBILITY WITH PARK ACTIVITIES AND RESOURCES**	Score	18	19	15	15	22	21	20	15	14	13	25	19	18	
				Total Possible	30	30	30	30	30	30	30	30	30	30	30	30	30	
				Percent	60%	63%	50%	50%	73%	70%	67%	50%	47%	43%	83%	63%	60%	
OPERABILITY ***Criteria relating to the technical capabilities and limitations of the transit vehicles and infrastructure proposed for use in the various alternatives and criteria relating to the objectives of the MTA/Municipal Railway in operating the system***																		
10	Operability	Engineering - Street grade	Grades between 6% and 9% not desirable for rail. Grades between 3% and 6% more desirable. Grades less than 3% most desirable	1 = Grade of 6% and more 3 = Grade of 3% to 5% 5 = Grade of 2% or less	5	5	5	5	5	5	5	3	3	5	5	5	[illegible]	
11	Operability	Engineering - Curves and Specialwork	Complex trackwork not desirable. Specialwork on steep grades not desirable. Curves on steep grades not desirable	1 = Large amount of curves and specialwork 5 = Minimal amount of curves and specialwork	[illegible]	4	4	4	3	1	2	3	4	4	2	4	4	
12	Operability	Maximize separate ROW for transit	Measurement of mileage operating in a separate off-street right-of-way	1 = Less than 25% in PRW 3 = 25 to 50% in PRW 5 = 50% or more in PRW	3	[illegible]	3	3	4	4	4	5	5	2	1	1	1	
	Operability	Operational flexibility and efficiency	Ability to store vehicles, serve large events, vary order of dispatch, maintain headways	1 = Low flex / eff 5 = High flex / eff	3	2	5	5	2	3	3	2	5	5	4	5	5	[illegible]
13	Operability	Minimize operating cost impacts	Estimated incremental additional operating cost for each alternative over current system	1 = High (estimated) operating cost 5 = Low (estimated) operating cost	4	4	4	4	[illegible]	3	3	3	[illegible]	2	1	2	2	

HISTORIC STREETCAR EXTENSION EIS
Preliminary Screening of Terminal Alternatives
July 11, 2007

Maximum score / criterion = 5

Estimated quantitative or un-measured ratings

SCREENING CRITERIA FOR TERMINAL OPTIONS					Within Fort Mason gates						Within NPS property			Other				
					1	2	3	4	5	RL	6	7	8	10	11	12	13	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Fort Mason Loop	Fort Mason Short Loop	Bldg A Loop	East-West Loop	North Wye	Modified North Wye: 2 tracks	North Wye: 2 tracks	[illegible]	Great Meadow Loop	F Mason Gate Loop	[illegible]	Marina Loop	Small Marina Loop	Comments
14	Operability	Service design	Adheres to Muni Service Planning guidelines fits in overall route network structure, straight line routes, minimize use of single-purpose shuttles, both directions same location	1 = Low adherence 5 = High adherence	3	2	4	4	2	3	3	2	4	3	3	3	3	
15	Operability	Surface operational safety	Surface operational safety of streetcar system is not compromised by any operating condition or combination of conditions	1 = Low safety levels 5 = High safety levels	3	3	4	4	3	3	3	3	4	2	2	2	2	
16	Operability	Vulnerability to delay	Susceptibility to potential streetcar delays from interference with internal circulation and parking (i e , within Fort Mason)	1 = High susceptibility 5 = Low susceptibility	1	1	2	2	4	4	4	5	5	2	2	2	2	
		Subtotal:	OPERABILITY	Score	26	24	31	31	26	26	27	26	34	25	20	24	24	
				Total Possible	40	40	40	40	40	40	40	40	40	40	40	40	40	
				Percent	65%	60%	78%	78%	65%	65%	68%	65%	85%	63%	50%	60%	60%	
LOCAL CONSIDERATIONS · *Criteria involving how the proposed terminal would be integrated with the adjacent neighborhoods and local plans and policies*																		
17	Local considerations	Impacts on neighboring uses	Potential for visual, noise, vibration, or other impacts on nearby residents and businesses	1 = High impact 5 = Minimal impact	4	4	4	4	3	3	3	2	2	2	1	2	2	
18	Local considerations	Interference with street traffic	Interference with traffic flow/patterns in an already congested area	1 = High degree of interference 5 = Low degree of interference	1	2	2	2	4	4	4	5	5	2	1	2	2	
19	Local considerations	Impact on parking	Results in loss of parking - either in lots or on-street	1 = High impact 5 = Minimal impact	[illegible]	2	2	2	4	3	3	5	5	1	1	1	1	
[illegible]	Local considerations	Plan consistency	Conformance with existing local plans and policies (i.e., GGNRA, city plans and policies)	1 = Inconsistent 5 = Consistent	3	3	3	3	3	3	3	2	2	1	1	1	1	
21	Local considerations	Adaptability	Adaptability for extension beyond Fort Mason; utility of turnaround trackage after extension, no extraneous or redundant trackwork	1 = Low 5 = High	2	2	1	1	4	4	5	4	1	3	2	3	3	
22	Local considerations	Impacts on landscape	Changes required to physical landscape (grading, fill removal)	1 = High (estimated) cost 5 = Low (estimated) cost	[illegible]	4	4	4	4	2	2	2	1	4	4	[illegible]	4	
23	Local considerations	Public safety	Public safety, including access for emergency vehicles Ability to access Fort Mason facilities by emergency vehicles	1 = Low safety levels 5 = High safety levels	3	4	3	2	5	5	5	5	5	1	2	1	1	
24	Local considerations	Public opinion	Estimated community support for terminal alternative	1 = Low 5 = High	4	2	4	4	4	3	3	1	1	1	1	1	1	
		Subtotal:	LOCAL CONSIDERATIONS	Score	23	23	23	22	31	27	28	26	22	15	13	15	15	
				Total Possible	40	40	40	40	40	40	40	40	40	40	40	40	40	
				Percent	58%	58%	58%	55%	78%	68%	70%	65%	55%	38%	33%	38%	38%	
			TOTAL	Score	78	77	82	81	89	85	86	76	79	61	66	66	65	
				Total Possible	125	125	125	125	125	125	125	125	125	125	125	125	125	
				Percent	62.4%	61.6%	65.6%	64.8%	71.2%	68.0%	68.8%	60.8%	63.2%	48.8%	52.8%	52.8%	52.0%	

Score Ranges: 70 % + | [illegible] | 60-64.9 % | 55-59.9 % | < 55%

APPENDIX B

Transportation and Circulation

Appendix B includes traffic turning movement counts at intersections in the project area and level of service calculation sheets.

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TRANSPORTATION-CIRCULATION

Traffic Turning Movement Counts at Intersections in the Project Area

A. Study Intersections (Weekday and Weekend Peak Periods)

1. Jefferson Street and Jones Street
2. Beach Street and Jones Street
3. Beach Street and Hyde Street
4. Jefferson Street and Leavenworth Street
5. Beach Street and Leavenworth Street
6. Beach Street and Larkin Street
7. Beach Street and Polk Street
8. Beach Street and Columbus Avenue

B. Embarcadero and Bay Street (used to set seasonal adjustment factor)

Intersection:	Jones /	Jefferson		Date:	January 16, 2008 — Wednesday
Direction	N / S <= Pick => E / W	N / S <= Pick => E / W			
Time Period:	4 P-6 P			Project: 100368	E Line SF

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound R	Apprh	Southbound L	Southbound T	Southbound R (c)	Apprh	Eastbound L	Eastbound T	Eastbound R	Apprh	Westbound L	Westbound T	Westbound L-tram	Apprh
4 :15	15												13	42	2	
4 :30	27												19	94	5	
4 :45	34												24	135	6	
5 :00	47												33	183	8	
5 :15	56												40	220	11	
5 :30	63												46	257	13	
5 :45	75												53	295	15	
6 :00	92												64	336	16	

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB L-tram (975)	Apprh PHF	15 min. totals	60 min totals	15-min Ending
4 :15	15	0	0	15	0	0	0	0	0	0	0	0	13	42	2	57	72		4
4 :30	12	0	0	12	0	0	0	0	0	0	0	0	6	52	3	61	73		4
4 :45	7	0	0	7	0	0	0	0	0	0	0	0	5	41	1	47	54		4
5 :00	13	0	0	13	0	0	0	0	0	0	0	0	9	48	2	59	72	271	5
5 :15	9	0	0	9	0	0	0	0	0	0	0	0	7	37	3	47	56	255	5
5 :30	7	0	0	7	0	0	0	0	0	0	0	0	6	37	2	45	52	234	5
5 :45	12	0	0	12	0	0	0	0	0	0	0	0	7	38	2	47	59	239	5
6 :00	17	0	0	17	0	0	0	0	0	0	0	0	11	41	1	53	70	237	6
	47	0	0		0	0	0		0	0	0		33	183	8			Peak Hour	
PEAK => HOUR TOTAL	47	0	0		0	0	0		0	0	0		33	183	8			271 Total Intersection Vol	

5 :00

WHOLE INTERSECTION

PEAK HR VOL	271	4 :00 Peak Period Starting at	5 :00 Peak Period Ending at
PEAK 15 MIN VOL	73		
PEAK HR FACTOR (PHF)	0.93		

-

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	47	-	-	224
PEAK 15 MIN VOL	15	-	-	61
PEAK HR FACTOR (PHF)	0.78	-	-	0.92
	CAUTION : PHF below 0.9	-	-	-

Intersection:	Jones /	Jefferson	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick =>	<= Pick => E / W		
Time Period:	12 N - 2:30 PM		Project:	E Line SF100368

INPUTS

Labels =>	Northbound			Apprh PHF	Southbound			Apprh PHF	Eastbound			Apprh PHF	Westbound			Apprh PHF
15-min period Ending Time	L	T	R		L	T	R		L	T	R		L	T	L Tram	
12 :15	14												15	49	2	
12 :30	33												34	131	3	
12 :45	54												53	195	6	
1 :00	70												78	264	8	
1 :15	88												124	355	9	
1 :30	114												162	444	11	
1 :45	129												186	532	14	
2 :00	147												207	611	17	
2 :15	176												234	704	18	
2 :30	203												256	789	21	
2 :45																
3 :00																

OUTPUTS

15-min period Ending Time	L	T	R	Apprh PHF	L	T	R	Apprh PHF	L	T	R	Apprh PHF	L	T	L Tram	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	14	0	0	14	0	0	0	0	0	0	0	0	15	49	2	66	80		12 :15
12 :30	19	0	0	19	0	0	0	0	0	0	0	0	19	82	1	102	121		12 :30
12 :45	21	0	0	21	0	0	0	0	0	0	0	0	19	64	3	86	107		12 :45
1 :00	16	0	0	16	0	0	0	0	0	0	0	0	25	69	2	96	112	420	1 :00
1 :15	18	0	0	18	0	0	0	0	0	0	0	0	46	91	1	138	156	496	1 :15
1 :30	26	0	0	26	0	0	0	0	0	0	0	0	38	89	2	129	155	530	1 :30
1 :45	15	0	0	15	0	0	0	0	0	0	0	0	24	88	3	115	130	553	1 :45
2 :00	18	0	0	18	0	0	0	0	0	0	0	0	21	79	3	103	121	562	2 :00
2 :15	29	0	0	29	0	0	0	0	0	0	0	0	27	93	1	121	150	556	2 :15
2 :30	27	0	0	27	0	0	0	0	0	0	0	0	22	85	3	110	137	538	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	77	0	0		0	0	0		0	0	0		129	347	9			562	
																		Total Intersection Vol	

Starting at 12:06 PM

WHOLE INTERSECTION

PEAK HR VOL	562
PEAK 15 MIN VOL	156
PEAK HR FACTOR (PHF)	0.90

WILBUR SMITH ASSOCIATES
201 Mission Street, # 1450, San Francisco, CA 94105
www.wilbursmith.com

Default Comments
Change These in The Preferences Window
Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : Jones_Beach_4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Jones (SB)					Beach (WB)					Jones (NB)					Beach (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	1	5	9	0	15	1	19	1	2	23	5	8	5	0	18	6	38	5	0	49	105
04:15 PM	2	7	2	0	11	2	20	1	2	25	3	9	5	0	17	6	33	3	0	42	95
04:30 PM	2	6	4	0	12	1	28	2	3	34	8	2	9	0	19	8	22	5	0	35	100
04:45 PM	4	8	3	0	15	1	21	0	1	23	4	8	3	0	15	6	29	7	0	42	95
Total	9	26	18	0	53	5	88	4	8	105	20	27	22	0	69	26	122	20	0	168	395
05:00 PM	2	7	4	0	13	4	20	6	3	33	4	4	3	0	11	5	39	1	0	45	102
05:15 PM	3	7	2	0	12	2	28	1	2	33	5	5	5	0	15	4	37	0	0	41	101
05:30 PM	2	2	3	0	7	1	32	0	2	35	2	4	6	0	12	2	37	4	0	43	97
05:45 PM	2	13	2	0	17	2	26	0	3	31	1	11	4	0	16	3	44	2	0	49	113
Total	9	29	11	0	49	9	106	7	10	132	12	24	18	0	54	14	157	7	0	178	413
Grand Total	18	55	29	0	102	14	194	11	18	237	32	51	40	0	123	40	279	27	0	346	808
Apprch %	17.6	53.9	28.4	0		5.9	81.9	4.6	7.6		26	41.5	32.5	0		11.6	80.6	7.8	0		
Total %	2.2	6.8	3.6	0	12.6	1.7	24	1.4	2.2	29.3	4	6.3	5	0	15.2	5	34.5	3.3	0	42.8	
Unshifted	18	55	29	0	102	14	194	11	18	237	32	51	40	0	123	40	279	27	0	346	808
% Unshifted	100	100	100	0	100	100	100	100	100	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Jones (SB)					Beach (WB)					Jones (NB)					Beach (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	2	7	**4**			**4**	20	**6**	**3**							**5**	39	1	0	45	102
05:15 PM	**3**	7	2	0	12	2	28	1	2	33	**5**										
05:30 PM	**2**	**2**	**3**	**0**	**7**	**1**	**32**	0	2	**35**	2	4	**6**	0	12	2	37	**4**	**0**	**43**	**97**
05:45 PM	**2**	**13**	**2**	**0**	**17**	2	26	0	3	31	1	**11**	4	0	**16**	3	**44**	**2**	**0**	**49**	**113**
Total Volume	9	29	11	0	49	9	106	7	10	132	12	24	18	0	54	14	157	7	0	178	413
% App. Total	18.4	59.2	22.4	0		6.8	80.3	5.3	7.6		22.2	44.4	33.3	0		7.9	88.2	3.9	0		
PHF	.750	.558	.688	.000	.721	.563	.828	.292	.833	.943	.600	.545	.750	.000	.844	.700	.892	.438	.000	.908	.914

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File Name : Jones_Beach_4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 2

	Jones (SB)					Beach (WB)					Jones (NB)					Beach (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	04:00 PM					05:00 PM					04:00 PM					05:00 PM					
+0 mins.	1	5	**9**		**15**	**4**	20	**6**	**3**							**5**	39	1	0	45	
+15 mins.	2	7	2	0	11	2	28	1	2	33	3	**9**	5	0	17	4	37	0	0	41	
+30 mins.	2	6	4	0	12	1	**32**	0	2	**35**	**8**		**9**	0	**19**	2	37	**4**			
+45 mins.	**4**	**8**	3	**0**	**15**	**2**	26	**0**	3	31	**4**	**8**	3	**0**	15	3	**44**	2	**0**	**49**	
Total Volume	9	26	18	0	53	9	106	7	10	132	20	27	22	0	69	14	157	7	0	178	
% App. Total	17	49.1	34	0		6.8	80.3	5.3	7.6		29	39.1	31.9	0		7.9	88.2	3.9	0		
PHF	.563	.813	.500	.000	.883	.563	.828	.292	.833	.943	.625	.750	.611	.000	.908	.700	.892	.438	.000	.908	

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File Name : Jones_Beach_12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Beach (southbound)					Jones (westbound)					Beach (northbound)					Jones (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 PM	6	2	8	0	16	2	39	6	0	47	10	18	14	0	42	8	59	4	0	71	176
12:15 PM	3	13	10	0	26	5	30	0	0	35	12	9	22	0	43	10	70	8	0	88	192
12:30 PM	3	11	7	0	21	2	35	3	0	40	8	11	12	0	31	9	50	9	0	68	160
12:45 PM	7	6	8	0	21	0	29	4	0	33	11	7	22	0	40	12	51	5	0	68	162
Total	19	32	33	0	84	9	133	13	0	155	41	45	70	0	156	39	230	26	0	295	690
01:00 PM	20	11	11	0	42	7	46	5	0	58	8	13	22	0	43	18	69	8	1	96	239
01:15 PM	10	14	14	0	38	4	37	4	0	45	11	20	14	0	45	18	50	7	0	75	203
01:30 PM	6	21	14	0	41	3	51	7	0	61	9	8	30	0	47	10	68	7	0	85	234
01:45 PM	7	9	10	0	26	3	51	11	0	65	8	8	22	0	38	16	83	9	0	108	237
Total	43	55	49	0	147	17	185	27	0	229	36	49	88	0	173	62	270	31	1	364	913
02:00 PM	9	11	14	0	34	5	54	9	0	68	13	10	17	0	40	12	73	10	0	95	237
Grand Total	71	98	96	0	265	31	372	49	0	452	90	104	175	0	369	113	573	67	1	754	1840
Apprch %	26.8	37	36.2	0		6.9	82.3	10.8	0		24.4	28.2	47.4	0		15	76	8.9	0.1		
Total %	3.9	5.3	5.2	0	14.4	1.7	20.2	2.7	0	24.6	4.9	5.7	9.5	0	20.1	6.1	31.1	3.6	0.1	41	
Unshifted	71	98	96	0	265	31	372	49	0	452	90	104	175	0	369	113	573	67	1	754	1840
% Unshifted	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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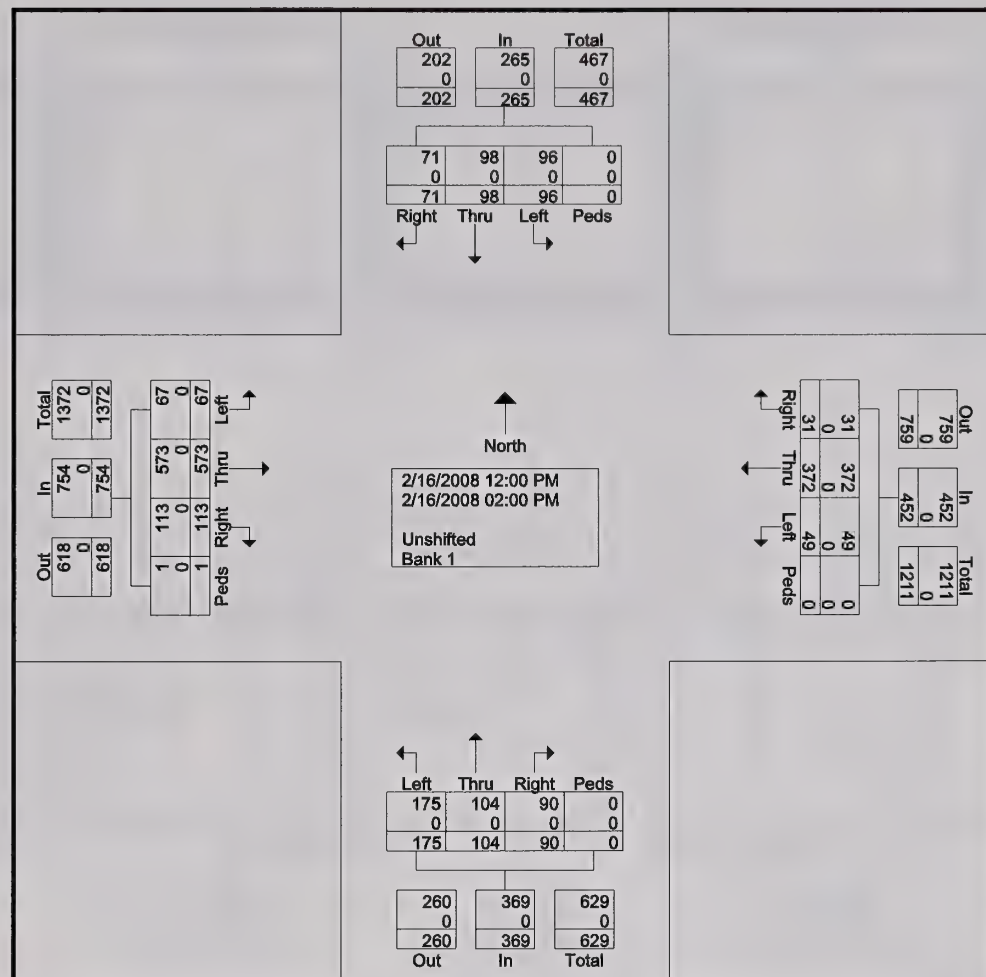
File Name : Jones_Beach_12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 2



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Then Click the Comments Tab

File Name : Jones_Beach_12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 3

	Beach (southbound)					Jones (westbound)					Beach (northbound)					Jones (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:00 PM																					
01:00 PM	**20**	11	11	0	**42**	**7**	46	5	0	58	8	13	22	0	43	**18**	69	8	**1**	96	**239**
01:15 PM	10	14	**14**								**11**	**20**	14	0	45	18	50	7	0	75	203
01:30 PM	6	**21**					**51**	7	0	61	9	8	**30**	0	**47**	10	68	7	0	85	234
01:45 PM	7	9	10	0	26	3	51	**11**	0	**65**	8	8	22	0	38	16	**83**	**9**		**108**	237
Total Volume	43	55	49	0	147	17	185	27	0	229	36	49	88	0	173	62	270	31	1	364	913
% App. Total	29.3	37.4	33.3	0		7.4	80.8	11.8	0		20.8	28.3	50.9	0		17	74.2	8.5	0.3		
PHF	.538	.655	.875	.000	.875	.607	.907	.614	.000	.881	.818	.613	.733	.000	.920	.861	.813	.861	.250	.843	.955

Intersection:	Hyde /	Beach	Date:	January 16, 2008 / Wednesday
Direction	N / S <= Pick => E / W	N / S <= Pick => E / W		
Time Period:	4 P-6 P		Project: 100368	E Line SF

INPUTS

Labels =>

15-min period Ending Time	Northbound Cable in	Northbound T	Northbound R	Apprh PHF	Southbound L	Southbound T	Southbound R (c)	Apprh PHF	Eastbound L	Eastbound T	Eastbound Cable out	Apprh PHF	Westbound L	Westbound T	Westbound R	Apprh PHF
4 :15	6		4		20	9	20		6	30	4			30	4	
4 :30	8		11		30	34	41		12	56	6			52	5	
4 :45	11		20		46	51	54		13	67	8			66	9	
5 :00	12		26		69	74	76		20	90	9			94	12	
5 :15	15		35		86	90	98		23	116	11			141	20	
5 :30	18		56		106	102	111		30	158	12			171	24	
5 :45	20		67		115	118	124		33	183	14			199	28	
6 :00	23		78		132	133	148		34	211	15			223	29	

OUTPUTS

15-min period Ending Time	NB Cable in	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB Cable out	Apprh PHF	WB L	WB T	WB R (975)	Apprh PHF	15 min. totals	60 min totals	15-min Ending
4 :15	6	0	4	10	20	9	20	49	6	30	4	40	0	30	4	34	133		4
4 :30	2	0	7	9	10	25	21	56	6	26	2	34	0	22	1	23	122		4
4 :45	3	0	9	12	16	17	13	46	1	11	2	14	0	14	4	18	90		4
5 :00	1	0	6	7	23	23	22	68	7	23	1	31	0	28	3	31	137	482	5
5 :15	3	0	9	12	17	16	22	55	3	26	2	31	0	47	8	55	153	502	5
5 :30	3	0	21	24	20	12	13	45	7	42	1	50	0	30	4	34	153	533	5
5 :45	2	0	11	13	9	16	13	38	3	25	2	30	0	28	4	32	113	556	5
6 :00	3	0	11	14	17	15	24	56	1	28	1	30	0	24	1	25	125	544	6
	9	0	47		69	67	70		20	116	6		0	133	19			Peak Hour	
PEAK => HOUR TOTAL	9	0	47		69	67	70		20	116	6		0	133	19			556 Total Intersection Vol	

5 :45

4 :45 Peak Period Starting at

5 :45 Peak Period Ending at

WHOLE INTERSECTION

PEAK HR VOL	556
PEAK 15 MIN VOL	153
PEAK HR FACTOR (PHF)	0.91

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	56	206	142	152
PEAK 15 MIN VOL	24	68	50	55
PEAK HR FACTOR (PHF)	0.58	0.76	0.71	0.69
	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9

Intersection:	Hyde / Beach	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick => <= Pick => E / W		
Time Period:	12 N - 2:30 PM	Project:	E Line SF100368

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound Cable Car	Northbound R	Southbound L	Southbound T	Southbound R	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound **
12 :15	1	0	24	34	28	31		39	8	13	49	2
12 :30	3	3	44	80	47	65		95	17	31	81	3
12 :45	4	4	66	109	68	89		135	19	40	111	5
1 :00	6	6	98	158	92	114		187	24	47	152	6
1 :15	8	6	115	209	131	161		258	34	57	195	7
1 :30	9	8	135	250	164	196		315	42	65	236	9
1 :45	9	8	168	292	188	233		364	53	74	276	10
2 :00	13	10	190	345	221	282		428	56	79	333	11
2 :15	13	12	215	398	258	320		492	77	88	387	12
2 :30	14	13	243	456	296	369		553	91	99	427	14
2 :45												
3 :00												

OUTPUTS

15-min period Ending Time	NB L	NB Cable Car	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB **	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	1	0	24	25	34	28	31	93	0	39	8	47	13	49	2	64	229		12 :15
12 :30	2	3	20	25	46	19	34	99	0	56	9	65	18	32	1	51	240		12 :30
12 :45	1	1	22	24	29	21	24	74	0	40	2	42	9	30	2	41	181		12 :45
1 :00	2	2	32	36	49	24	25	98	0	52	5	57	7	41	1	49	240	890	1 :00
1 :15	2	0	17	19	51	39	47	137	0	71	10	81	10	43	1	54	291	952	1 :15
1 :30	1	2	20	23	41	33	35	109	0	57	8	65	8	41	2	51	248	960	1 :30
1 :45	0	0	33	33	42	24	37	103	0	49	11	60	9	40	1	50	246	1025	1 :45
2 :00	4	2	22	28	53	33	49	135	0	64	3	67	5	57	1	63	293	1078	2 :00
2 :15	0	2	25	27	53	37	38	128	0	64	21	85	9	54	1	64	304	1091	2 :15
2 :30	1	1	28	30	58	38	49	145	0	61	14	75	11	40	2	53	303	1146	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	5	5	108		206	132	173		0	238	49		34	191	5			1146 Total Intersection Vol	

** Cable cars from the lot to sb Hyde St.

WHOLE INTERSECTION

PEAK HR VOL	1,146
PEAK 15 MIN VOL	304
PEAK HR FACTOR (PHF)	0.94

Intersection: Leavenworth / Jefferson

Direction: N / S <= Pick => E / W N / S <= Pick => E / W

Time Period: 4 P-6 P

Date: January 16, 2008 Wednesday

Project: 100368 E Line SF

INPUTS

Labels => 15-min period Ending Time	Northbound L	Northbound T	Northbound R	Apprh PHF	Southbound L	Southbound T	Southbound R	Apprh PHF	Eastbound L	Eastbound T	Eastbound R	Apprh PHF	Westbound L	Westbound T	Westbound R	Apprh PHF
4 :15	10	0				4	1						19	41	1	
4 :30	20	0				4	1						35	86	2	
4 :45	37	3				6	1						44	124	3	
5 :00	52	6				8	1						64	170	4	
5 :15	64	8				12	1						77	201	5	
5 :30	85	9				14	2						95	230	5	
5 :45	95	11				17	2						106	264	5	
6 :00	112	12				17	2						118	300	5	

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R (975)	Apprh PHF	15 min. totals	60 min totals	15-min Ending
4 :15	10	0	0	10	0	4	1	5	0	0	0	0	19	41	1	61	76		4
4 :30	10	0	0	10	0	0	0	0	0	0	0	0	16	45	1	62	72		4
4 :45	17	3	0	20	0	2	0	2	0	0	0	0	9	38	1	48	70		4
5 :00	15	3	0	18	0	2	0	2	0	0	0	0	20	46	1	67	87	305	5
5 :15	12	2	0	14	0	4	0	4	0	0	0	0	13	31	1	45	63	292	5
5 :30	21	1	0	22	0	2	1	3	0	0	0	0	18	29	0	47	72	292	5
5 :45	10	2	0	12	0	3	0	3	0	0	0	0	11	34	0	45	60	282	5
6 :00	17	1	0	18	0	0	0	0	0	0	0	0	12	36	0	48	66	261	6
	52	6	0		0	8	1		0	0	0		64	170	4			Peak Hour	
PEAK => HOUR TOTAL	52	6	0		0	8	1		0	0	0		64	170	4			305 Total Intersection Vol	

5 :00

WHOLE INTERSECTION

PEAK HR VOL 305

PEAK 15 MIN VOL 87

PEAK HR FACTOR (PHF) 0.88

CAUTION : PHF below 0.9

4 :00 Peak Period Starting at

5 :00 Peak Period Ending at

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	58	9	-	238
PEAK 15 MIN VOL	20	5	-	67
PEAK HR FACTOR (PHF)	0.73	0.45	-	0.89
	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	-	CAUTION : PHF below 0.9

Intersection:	Leavenworth /	Jefferson	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick =>	<= Pick => E / W		
Time Period:	12 N - 2:30 PM		Project:	E Line SF100368

INPUTS

Labels => 15-min period Ending Time	Northbound L	Northbound T	Northbound R	Southbound L	Southbound T	Southbound R	Eastbound L	Eastbound T	Eastbound R	Westbound L	Westbound T	Westbound R
12 :15	24	4			3	0				28	55	0
12 :30	49	7			6	1				49	115	1
12 :45	81	8			7	1				62	176	1
1 :00	116	12			11	1				73	237	2
1 :15	145	17			15	3				91	323	4
1 :30	181	19			19	5				117	406	8
1 :45	217	21			20	6				133	479	9
2 :00	257	28			27	6				151	563	11
2 :15	298	33			33	9				167	644	13
2 :30	338	34			39	10				196	750	14
2 :45												
3 :00												

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	24	4	0	28	0	3	0	3	0	0	0	0	28	55	0	83	114		12 :15
12 :30	25	3	0	28	0	3	1	4	0	0	0	0	21	60	1	82	114		12 :30
12 :45	32	1	0	33	0	1	0	1	0	0	0	0	13	61	0	74	108		12 :45
1 :00	35	4	0	39	0	4	0	4	0	0	0	0	11	61	1	73	116	452	1 :00
1 :15	29	5	0	34	0	4	2	6	0	0	0	0	18	86	2	106	146	484	1 :15
1 :30	36	2	0	38	0	4	2	6	0	0	0	0	26	83	4	113	157	527	1 :30
1 :45	36	2	0	38	0	1	1	2	0	0	0	0	16	73	1	90	130	549	1 :45
2 :00	40	7	0	47	0	7	0	7	0	0	0	0	18	84	2	104	158	591	2 :00
2 :15	41	5	0	46	0	6	3	9	0	0	0	0	16	81	2	99	154	599	2 :15
2 :30	40	1	0	41	0	6	1	7	0	0	0	0	29	106	1	136	184	626	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	157	15	0		0	20	5		0	0	0		79	344	6			626 Total Intersection Vol	

WHOLE INTERSECTION

PEAK HR VOL	626
PEAK 15 MIN VOL	184
PEAK HR FACTOR (PHF)	0.85

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File Name : Leavenworth_Beach 4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Leavenworth (SB)					Beach (WB)					Leavenworth (NB)					Beach (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	1	14	6	0	21	1	17	7	0	25	4	3	3	0	10	1	34	6	0	41	97
04:15 PM	3	12	8	0	23	1	19	11	0	31	6	3	2	0	11	0	22	6	0	28	93
04:30 PM	3	4	7	0	14	2	28	12	0	42	8	9	2	0	19	2	20	13	0	35	110
04:45 PM	1	11	11	0	23	1	24	3	0	28	1	4	0	0	5	2	31	14	0	47	103
Total	8	41	32	0	81	5	88	33	0	126	19	19	7	0	45	5	107	39	0	151	403
05:00 PM	1	14	5	0	20	3	19	9	0	31	3	4	3	0	10	2	34	9	0	45	106
05:15 PM	2	10	10	0	22	2	30	7	0	39	4	10	1	0	15	2	23	13	0	38	114
05:30 PM	0	5	8	0	13	3	29	12	0	44	5	1	0	0	6	2	29	9	0	40	103
05:45 PM	0	7	7	0	14	4	17	14	0	35	7	6	4	0	17	1	30	10	0	41	107
Total	3	36	30	0	69	12	95	42	0	149	19	21	8	0	48	7	116	41	0	164	430
Grand Total	11	77	62	0	150	17	183	75	0	275	38	40	15	0	93	12	223	80	0	315	833
Apprch %	7.3	51.3	41.3	0		6.2	66.5	27.3	0		40.9	43	16.1	0		3.8	70.8	25.4	0		
Total %	1.3	9.2	7.4	0	18	2	22	9	0	33	4.6	4.8	1.8	0	11.2	1.4	26.8	9.6	0	37.8	
Unshifted	11	77	62	0	150	17	183	75	0	275	38	40	15	0	93	12	223	80	0	315	833
% Unshifted	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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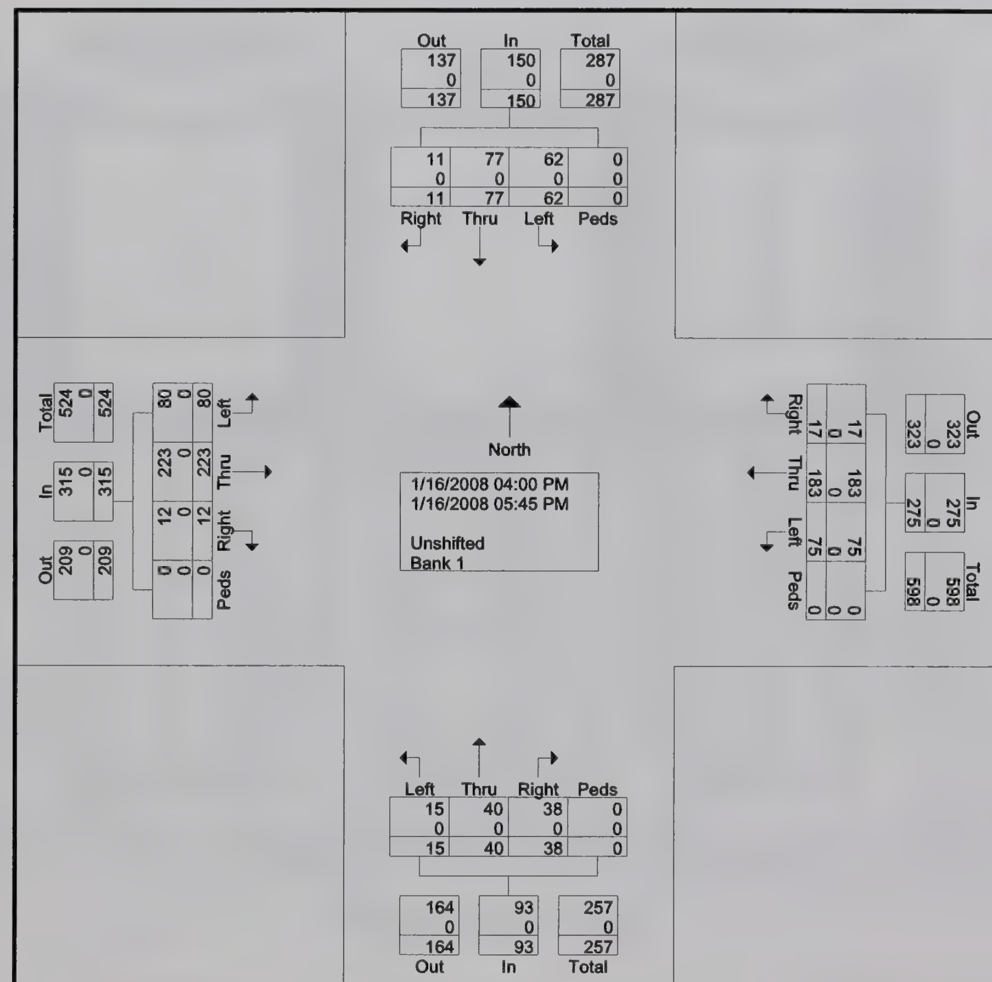
File Name : Leavenworth_Beach 4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 2



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File Name : Leavenworth_Beach 4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 3

	Leavenworth (SB)					Beach (WB)					Leavenworth (NB)					Beach (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	**3**	4	7	0	14	2	28	**12**	0	**42**	**8**				**19**	**2**	20	13	0	35	110
04:45 PM	1	11	**11**		**23**	1	24	3	0	28	1	4	0	0	5	2	31	**14**		**47**	103
05:00 PM	1	**14**				**3**	19	9	0	31	3	4	**3**	0	10	2	**34**				
05:15 PM	**2**	**10**	**10**	**0**	**22**	**2**	**30**	7	0	39	4	**10**	1	0	15	2	23	13	0	38	**114**
Total Volume	7	39	33	0	79	8	101	31	0	140	16	27	6	0	49	8	108	49	0	165	433
% App. Total	8.9	49.4	41.8	0		5.7	72.1	22.1	0		32.7	55.1	12.2	0		4.8	65.5	29.7	0		
PHF	.583	.696	.750	.000	.859	.667	.842	.646	.000	.833	.500	.675	.500	.000	.645	1.000	.794	.875	.000	.878	.950

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Each Approach Begins at:

	Leavenworth (SB)					Beach (WB)					Leavenworth (NB)					Beach (EB)				
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total
	04:00 PM					05:00 PM					04:30 PM					04:45 PM				
+0 mins.	1	**14**									**8**				**19**	**2**	31	**14**		**47**
+15 mins.	**3**	12	8	0	**23**	2	**30**	7	0	39	1	4	0	0	5	2	**34**			
+30 mins.	**3**	**4**	**7**	**0**	**14**	**3**	**29**	**12**	**0**	**44**	3	4	**3**	0	10	2	23	13	0	38
+45 mins.	1	11	**11**			**4**	17	**14**	0	35	4	**10**	1	0	15	2	29	9	0	40
Total Volume	8	41	32	0	81	12	95	42	0	149	16	27	6	0	49	8	117	45	0	170
% App. Total	9.9	50.6	39.5	0		8.1	63.8	28.2	0		32.7	55.1	12.2	0		4.7	68.8	26.5	0	
PHF	.667	.732	.727	.000	.880	.750	.792	.750	.000	.847	.500	.675	.500	.000	.645	1.000	.860	.804	.000	.904

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File Name : Leavenworth_Beach 12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Leavenworth (southbound)					Beach (westbound)					Leavenworth (northbound)					Beach (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:00 PM	7	10	21	0	38	4	33	16	0	53	14	9	2	0	25	5	53	17	0	75	191
12:15 PM	2	6	18	0	26	5	31	6	0	42	12	11	3	0	26	3	63	9	0	75	169
12:30 PM	3	6	10	0	19	6	31	8	0	45	9	12	5	0	26	3	61	17	0	81	171
12:45 PM	4	6	7	0	17	9	28	6	0	43	9	12	7	0	28	5	75	23	0	103	191
Total	16	28	56	0	100	24	123	36	0	183	44	44	17	0	105	16	252	66	0	334	722
01:00 PM	2	6	13	0	21	7	32	8	0	47	26	10	3	0	39	6	78	22	0	106	213
01:15 PM	4	14	16	0	34	6	32	10	0	48	12	19	8	0	39	4	71	18	0	93	214
01:30 PM	2	3	10	0	15	15	55	13	1	84	16	14	1	0	31	6	66	23	0	95	225
01:45 PM	6	11	12	0	29	13	42	18	0	73	38	18	4	0	60	6	61	24	0	91	253
Total	14	34	51	0	99	41	161	49	1	252	92	61	16	0	169	22	276	87	0	385	905
02:00 PM	1	10	14	0	25	9	51	23	0	83	20	22	5	0	47	10	60	23	0	93	248
02:15 PM	1	13	20	0	34	10	49	17	0	76	21	13	2	0	36	9	73	19	0	101	247
Grand Total	32	85	141	0	258	84	384	125	1	594	177	140	40	0	357	57	661	195	0	913	2122
Apprch %	12.4	32.9	54.7	0		14.1	64.6	21	0.2		49.6	39.2	11.2	0		6.2	72.4	21.4	0		
Total %	1.5	4	6.6	0	12.2	4	18.1	5.9	0	28	8.3	6.6	1.9	0	16.8	2.7	31.1	9.2	0	43	
Unshifted	32	85	141	0	258	84	384	125	1	594	177	140	40	0	357	57	661	195	0	913	2122
% Unshifted	100	100	100	0	100	100	100	100	100	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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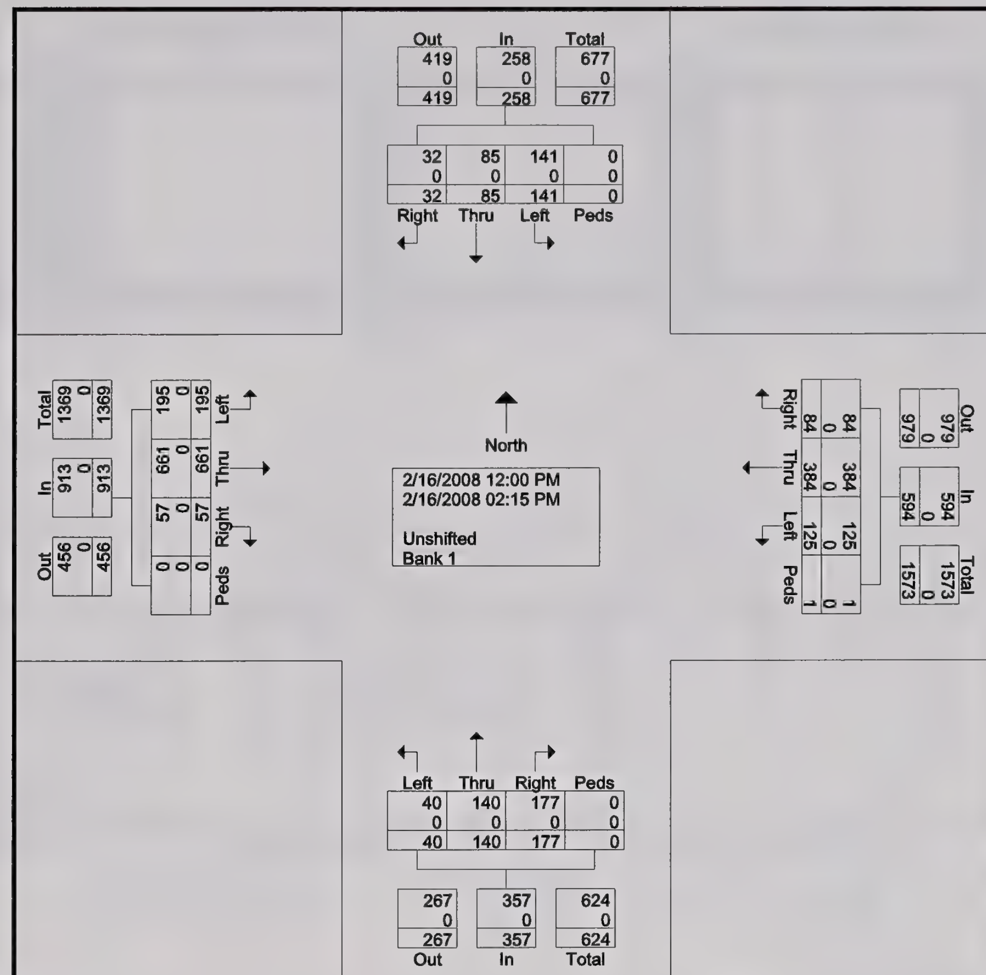
File Name : Leavenworth_Beach 12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 2



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Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : Leavenworth_Beach 12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 3

	Leavenworth (southbound)					Beach (westbound)					Leavenworth (northbound)					Beach (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:30 PM																					
01:30 PM	2	3	10	0	15	**15**	**55**	13	**1**	**84**	16	14	1	0	31	6	66	23	0	95	225
01:45 PM	**6**	11	12	0	29	13	42	18	0	73	**38**				**60**	6	61	**24**			**253**
02:00 PM	1	10	14	0	25	9	51	**23**	0	83	20	**22**	**5**	0	47	**10**	60	23	0	93	248
02:15 PM	1	**13**	**20**		**34**	10	49	17	0	76	21	13	2	0	36	9	**73**			**101**	247
Total Volume	10	37	56	0	103	47	197	71	1	316	95	67	12	0	174	31	260	89	0	380	973
% App. Total	9.7	35.9	54.4	0		14.9	62.3	22.5	0.3		54.6	38.5	6.9	0		8.2	68.4	23.4	0		
PHF	.417	.712	.700	.000	.757	.783	.895	.772	.250	.940	.625	.761	.600	.000	.725	.775	.890	.927	.000	.941	.961

Intersection: Larkin / Beach
Direction N / S <= Pick => E / W   N / S := Pick =: E / W
Time Period: 4 P-6 P

Date: January 16, 2008 Wednesday
Project: 100368   E Line SF

INPUTS

Labels =>	Northbound L	Northbound T	Northbound R	Apprh PHF	Southbound L	Southbound T	Southbound R	Apprh PHF	Eastbound L	Eastbound T	Eastbound R	Apprh PHF	Westbound L	Westbound T	Westbound R	Apprh PHF
15-min period Ending Time																
4:15	3		8							16	4		11	30		
4:30	7		21							33	8		20	68		
4:45	9		30							50	13		28	107		
5:00	15		46							69	15		44	130		
5:15	23		61							83	21		58	163		
5:30	26		82							96	27		71	190		
5:45	31		90							119	29		83	221		
6:00	35		99							130	31		90	257		

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R 975	Apprh PHF	15 min. totals	60 min totals	15-min Ending
4 :15	3	0	8	11	0	0	0	0	0	16	4	20	11	30	0	41	72		4
4 :30	4	0	13	17	0	0	0	0	0	17	4	21	9	38	0	47	85		4
4 :45	2	0	9	11	0	0	0	0	0	17	5	22	8	39	0	47	80		4
5 :00	6	0	16	22	0	0	0	0	0	19	2	21	16	23	0	39	82	319	5
5 :15	8	0	15	23	0	0	0	0	0	14	6	20	14	33	0	47	90	337	5
5 :30	3	0	21	24	0	0	0	0	0	13	6	19	13	27	0	40	83	335	5
5 :45	5	0	8	13	0	0	0	0	0	23	2	25	12	31	0	43	81	336	5
6 :00	4	0	9	13	0	0	0	0	0	11	2	13	7	36	0	43	69	323	6
	20	0	53		0	0	0		0	67	17		47	133	0			Peak Hour	
PEAK => HOUR TOTAL	20	0	53		0	0	0		0	67	17		47	133	0			337 Total Intersection Vol	

5 :15

WHOLE INTERSECTION

PEAK HR VOL	337
PEAK 15 MIN VOL	90
PEAK HR FACTOR (PHF)	0.94

4 :15 Peak Period Starting at
5 :15 Peak Period Ending at

-

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	73	-	84	180
PEAK 15 MIN VOL	23	-	22	47
PEAK HR FACTOR (PHF)	0.79	-	0.95	0.96
	CAUTION : PHF below 0.9	-	-	-

Intersection:	Larkin / Beach	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick => <= Pick => E / W		
Time Period:	12 N - 2:30 PM	Project:	E Line SF100368

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound R	Apprh	Southbound L	Southbound T	Southbound R	Apprh	Eastbound L	Eastbound T	Eastbound R	Apprh	Westbound L	Westbound T	Westbound R	Apprh
12 :15	10		20							22	3		18	58		
12 :30	20		48							47	7		32	106		
12 :45	29		65							78	18		54	150		
1 :00	44		86							118	32		87	188		
1 :15	54		133							155	40		117	249		
1 :30	62		163							191	47		150	298		
1 :45	74		193							223	68		187	345		
2 :00	82		221							250	81		234	405		
2 :15	93		265							301	97		260	468		
2 :30	115		299							349	106		285	533		
2 :45																
3 :00																

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	10	0	20	30	0	0	0	0	0	22	3	25	18	58	0	76	131		12 :15
12 :30	10	0	28	38	0	0	0	0	0	25	4	29	14	48	0	62	129		12 :30
12 :45	9	0	17	26	0	0	0	0	0	31	11	42	22	44	0	66	134		12 :45
1 :00	15	0	21	36	0	0	0	0	0	40	14	54	33	38	0	71	161	555	1 :00
1 :15	10	0	47	57	0	0	0	0	0	37	8	45	30	61	0	91	193	617	1 :15
1 :30	8	0	30	38	0	0	0	0	0	36	7	43	33	49	0	82	163	651	1 :30
1 :45	12	0	30	42	0	0	0	0	0	32	21	53	37	47	0	84	179	696	1 :45
2 :00	8	0	28	36	0	0	0	0	0	27	13	40	47	60	0	107	183	718	2 :00
2 :15	11	0	44	55	0	0	0	0	0	51	16	67	26	63	0	89	211	736	2 :15
2 :30	22	0	34	56	0	0	0	0	0	48	9	57	25	65	0	90	203	776	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	53	0	136		0	0	0		0	158	59		135	235	0			776 Total Intersection Vol	

WHOLE INTERSECTION

PEAK HR VOL	776
PEAK 15 MIN VOL	211
PEAK HR FACTOR (PHF)	0.92

Intersection: Polk / Beach
Direction: N / S <= Pick => E / W; N / S := Pick =: E / W
Time Period: 4 P-6 P

Date: January 16, 2008 Wednesday
Project: 100368 E Line SF

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound R	Apprh PHF	Southbound L	Southbound T	Southbound R	Apprh PHF	Eastbound L	Eastbound T	Eastbound R	Apprh PHF	Westbound L	Westbound T	Westbound R	Apprh PHF
4 :15	0		10							7	5		30	4		
4 :30	3		23							15	10		62	8		
4 :45	8		34							16	16		98	11		
5 :00	12		51							20	24		131	14		
5 :15	12		65							22	31		174	15		
5 :30	13		76							23	35		207	15		
5 :45	15		98							26	41		242	15		
6 :00	16		109							27	47		280	18		

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R	Apprh PHF	15 min. totals	60 min totals	15-min Ending
															975				
4 :15	0	0	10	10	0	0	0	0	0	7	5	12	30	4	0	34	56		4
4 :30	3	0	13	16	0	0	0	0	0	8	5	13	32	4	0	36	65		4
4 :45	5	0	11	16	0	0	0	0	0	1	6	7	36	3	0	39	62		4
5 :00	4	0	17	21	0	0	0	0	0	4	8	12	33	3	0	36	69	252	5
5 :15	0	0	14	14	0	0	0	0	0	2	7	9	43	1	0	44	67	263	5
5 :30	1	0	11	12	0	0	0	0	0	1	4	5	33	0	0	33	50	248	5
5 :45	2	0	22	24	0	0	0	0	0	3	6	9	35	0	0	35	68	254	5
6 :00	1	0	11	12	0	0	0	0	0	1	6	7	38	3	0	41	60	245	6
	12	0	55		0	0	0		0	15	26		144	11	0			Peak Hour	
PEAK => HOUR TOTAL	12	0	55		0	0	0		0	15	26		144	11	0			263 Total Intersection Vol	

5 :15

WHOLE INTERSECTION

PEAK HR VOL	263	4 :15 Peak Period Starting at
PEAK 15 MIN VOL	69	5 :15 Peak Period Ending at
PEAK HR FACTOR (PHF)	0.95	

-

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	67	-	41	155
PEAK 15 MIN VOL	21	-	13	44
PEAK HR FACTOR (PHF)	0.80	-	0.79	0.88
	CAUTION : PHF below 0.9	-	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9

3HR3

Intersection:	Polk / Beach	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick => <= Pick => E / W		
Time Period:	12 N - 2:30 PM	Project:	E Line SF100368

INPUTS

Labels =>

15-min period Ending Time	Northbound L	T	R	Apprh	Southbound L	T	R	Apprh	Eastbound L	T	R	Apprh	Westbound L	T	R	Apprh
12 :15	1		35							5	2		59	7		
12 :30	6		62							8	6		105	7		
12 :45	9		91							13	8		156	10		
1 :00	16		160							18	19		183	21		
1 :15	22		197							23	24		240	27		
1 :30	30		244							31	31		294	32		
1 :45	37		287							38	36		340	41		
2 :00	47		335							49	44		394	50		
2 :15	53		392							59	49		442	57		
2 :30	63		447							70	61		521	66		
2 :45																
3 :00																

OUTPUTS

15-min period Ending Time	NB L	T	R	Apprh PHF	SB L	T	R	Apprh PHF	EB L	T	R	Apprh PHF	WB L	T	R	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	1	0	35	36	0	0	0	0	0	5	2	7	59	7	0	66	109		12 :15
12 :30	5	0	27	32	0	0	0	0	0	3	4	7	46	0	0	46	85		12 :30
12 :45	3	0	29	32	0	0	0	0	0	5	2	7	51	3	0	54	93		12 :45
1 :00	7	0	69	76	0	0	0	0	0	5	11	16	27	11	0	38	130	417	1 :00
1 :15	6	0	37	43	0	0	0	0	0	5	5	10	57	6	0	63	116	424	1 :15
1 :30	8	0	47	55	0	0	0	0	0	8	7	15	54	5	0	59	129	468	1 :30
1 :45	7	0	43	50	0	0	0	0	0	7	5	12	46	9	0	55	117	492	1 :45
2 :00	10	0	48	58	0	0	0	0	0	11	8	19	54	9	0	63	140	502	2 :00
2 :15	6	0	57	63	0	0	0	0	0	10	5	15	48	7	0	55	133	519	2 :15
2 :30	10	0	55	65	0	0	0	0	0	11	12	23	79	9	0	88	176	566	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	33	0	203		0	0	0		0	39	30		227	34	0			566 Total Intersection Vol	

WHOLE INTERSECTION

PEAK HR VOL	566
PEAK 15 MIN VOL	176
PEAK HR FACTOR (PHF)	0.80

Intersection:	Columbus /	Beach	Date:	January 16, 2008 / Wednesday
Direction	N / S <= Pick =>	<= Pick => E / W		
Time Period:	4:00 PM - 6:00 PM		Project:	E Line SF100368

Labels =>	Northbound			Apprh PHF	Southbound			Apprh PHF	Eastbound			Apprh PHF	Westbound			Apprh PHF
15-min period Ending Time	L	T	R		L	T	R		L	T	R		L	T	R	
4 :15																
4 :30																
4 :45																
5 :00																
5 :15																
5 :30																
5 :45																
6 :00																

OUTPUTS

15-min period Ending Time	L	T	R	Apprh PHF	L	T	R	Apprh PHF	L	T	R	Apprh PHF	L	T	R	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
4 :15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		4 :15
4 :30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		4 :30
4 :45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		4 :45
5 :00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 :00
5 :15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 :15
5 :30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 :30
5 :45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 :45
6 :00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6 :00
PEAK => HOUR TOTAL	47	0	30		0	0	0		0	187	97		21	125	0			Peak Hour 507 Total Intersection Vol	

Peak-hour total row is correct (i.e., matches LOS calculation sheet). Awaiting raw traffic count data (showing 15-minute subtotals) from Wilbur Smith Associates.

Intersection:	Columbus / Beach	Date:	February 16, 2008 Saturday
Direction	N / S <= Pick => <= Pick => E / W	Project:	E Line SF100368
Time Period:	12 N - 2:30 PM		

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound R	Apprh	Southbound L	Southbound T	Southbound R	Apprh	Eastbound L	Eastbound T	Eastbound R	Apprh	Westbound L	Westbound T	Westbound R	Apprh
12 :15	5		2							43	12		4	29		
12 :30	15		17							128	79		9	62		
12 :45	27		32							205	135		15	92		
1 :00	41		49							286	151		20	121		
1 :15	54		62							360	177		26	153		
1 :30	68		75							438	205		32	186		
1 :45	81		91							519	241		40	234		
2 :00	96		108							604	275		50	273		
2 :15	109		122							681	317		61	317		
2 :30	121		136							780	364		69	358		
2 :45																
3 :00																

OUTPUTS

15-min period Ending Time	NB L	NB T	NB R	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R	Apprh PHF	15 min. totals	60 min totals	15-min period Ending Time
12 :15	5	0	2	7	0	0	0	0	0	43	12	55	4	29	0	33	95		12 :15
12 :30	10	0	15	25	0	0	0	0	0	85	67	152	5	33	0	38	215		12 :30
12 :45	12	0	15	27	0	0	0	0	0	77	56	133	6	30	0	36	196		12 :45
1 :00	14	0	17	31	0	0	0	0	0	81	16	97	5	29	0	34	162	668	1 :00
1 :15	13	0	13	26	0	0	0	0	0	74	26	100	6	32	0	38	164	737	1 :15
1 :30	14	0	13	27	0	0	0	0	0	78	28	106	6	33	0	39	172	694	1 :30
1 :45	13	0	16	29	0	0	0	0	0	81	36	117	8	48	0	56	202	700	1 :45
2 :00	15	0	17	32	0	0	0	0	0	85	34	119	10	39	0	49	200	738	2 :00
2 :15	13	0	14	27	0	0	0	0	0	77	42	119	11	44	0	55	201	775	2 :15
2 :30	12	0	14	26	0	0	0	0	0	99	47	146	8	41	0	49	221	824	2 :30
	-	-	-		-	-	-		-	-	-		-	-	-			Peak Hour	
PEAK => HOUR TOTAL	53	0	61		0	0	0		0	342	159		37	172	0			824 Total Intersection Vol	

WHOLE INTERSECTION

PEAK HR VOL	824
PEAK 15 MIN VOL	221
PEAK HR FACTOR (PHF)	0.93

2HRpm12

Intersection: Them Dmbarcadero / Bay St.

Direction: N/S <= Pick => E/W N/S := Pick = E/W

Time Period: 4 - 6 PM

Date: June 20, 2007 Wednesday

Project: 100919

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound U	Apprh PHF	Southbound (A, c) L	Southbound T	Southbound R	Apprh PHF	Eastbound L	Eastbound T	Eastbound R	Apprh PHF	Westbound (a, B) L	Westbound T	Westbound R	Apprh PHF
4 :15	230	155	9			146	2		4		123					
4 :30	384	279	10			314	6		9		243					
4 :45	598	433	15			433	7		14		372					
5 :00	830	580	16			560	11		15		507					
5 :15	1086	700	16			713	16		22		645					
5 :30	1355	843	16			834	24		27		804					
5 :45	1645	985	16			963	28		31		946					
6 :00	1947	1136	17			1091	34		32		1067					

OUTPUTS

15-min period Ending Time	NB L	NB T	NB U	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R (975)	Apprh PHF	15 min. totals	60 min totals	15-min Ending
4 :15	230	155	9	394	0	146	2	148	4	0	123	127	0	0	0	0	669		4
4 :30	154	124	1	279	0	168	4	172	5	0	120	125	0	0	0	0	576		4
4 :45	214	154	5	373	0	119	1	120	5	0	129	134	0	0	0	0	627		4
5 :00	232	147	1	380	0	127	4	131	1	0	135	136	0	0	0	0	647	2519	5
5 :15	256	120	0	376	0	153	5	158	7	0	138	145	0	0	0	0	679	2529	5
5 :30	269	143	0	412	0	121	8	129	5	0	159	164	0	0	0	0	705	2658	5
5 :45	290	142	0	432	0	129	4	133	4	0	142	146	0	0	0	0	711	2742	5
6 :00	302	151	1	454	0	128	6	134	1	0	121	122	0	0	0	0	710	2805	6
	1117	556	1		0	531	23		17	0	560		0	0	0			Peak Hour	
PEAK => HOUR TOTAL	1117	556	1		0	531	23		17	0	560		0	0	0			2805 Total Intersection Vol	

6 :00

5 :00 Peak Period Starting at

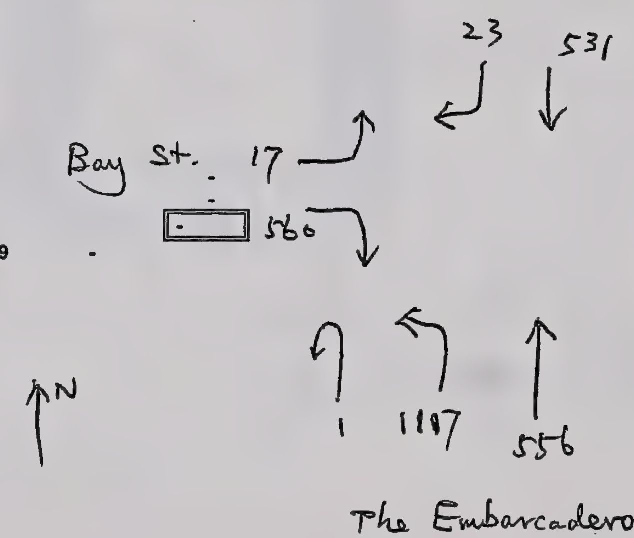
6 :00 Peak Period Ending at

WHOLE INTERSECTION

PEAK HR VOL	2,805
PEAK 15 MIN VOL	711
PEAK HR FACTOR (PHF)	0.99

BY APPROACH

	Northbound	Southbound	Eastbound	Westbound
PEAK HR VOL	1,674	554	577	
PEAK 15 MIN VOL	454	158	164	
PEAK HR FACTOR (PHF)	0.92	0.88	0.88	-
		CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	



Intersection:	Embarcadero / Bay	Date:	June 23, 2007 Saturday
Direction	N / S <= Pick => E / W	N / S := Pick =: E / W	Project: 100919	
Time Period:	12N - 2P		

INPUTS

Labels =>

15-min period Ending Time	Northbound L	Northbound T	Northbound U	Apprh PHF	Southbound L	Southbound T (A)	Southbound R (c)	Apprh PHF	Eastbound L	Eastbound T	Eastbound R	Apprh PHF	Westbound L (a)	Westbound T (B)	Westbound R	Apprh PHF
12:15	108	219	3			107	4		8		201					
12:30	232	483	4			192	8		15		355					
12:45	328	662	5			284	11		23		496					
1:00	451	894	5			394	17		27		629					
1:15	554	1068	6			485	24		32		733					
1:30	680	1307	8			593	35		34		854					
1:45	799	1528	12			706	45		37		971					
2:00	908	1728	12			817	53		43		1083					

OUTPUTS

15-min period Ending Time	NB L	NB T	NB U	Apprh PHF	SB L	SB T	SB R	Apprh PHF	EB L	EB T	EB R	Apprh PHF	WB L	WB T	WB R	Apprh PHF	15 min. totals	60 min totals	15-min Ending
															975				
12 :15	108	219	3	330	0	107	4	111	8	0	201	209	0	0	0	0	650		12
12 :30	124	264	1	389	0	85	4	89	7	0	154	161	0	0	0	0	639		12
12 :45	96	179	1	276	0	92	3	95	8	0	141	149	0	0	0	0	520		12
1 :00	123	232	0	355	0	110	6	116	4	0	133	137	0	0	0	0	608	2417	1
1 :15	103	174	1	278	0	91	7	98	5	0	104	109	0	0	0	0	485	2252	1
1 :30	126	239	2	367	0	108	11	119	2	0	121	123	0	0	0	0	609	2222	1
1 :45	119	221	4	344	0	113	10	123	3	0	117	120	0	0	0	0	587	2289	1
2 :00	109	200	0	309	0	111	8	119	6	0	112	118	0	0	0	0	546	2227	2
	451	894	5		0	394	17		27	0	629		0	0	0			Peak Hour	
PEAK => HOUR TOTAL	451	894	5		0	394	17		27	0	629		0	0	0			2417 Total Intersection Vol	

1 :00

WHOLE INTERSECTION

PEAK HR VOL	2,417	12 :00	1 :00
PEAK 15 MIN VOL	650	Peak Period Starting at	Peak Period Ending at
PEAK HR FACTOR (PHF)	0.93		

BY APPROACH

PEAK HR VOL	1,350	411	656	-
PEAK 15 MIN VOL	389	116	209	-
PEAK HR FACTOR (PHF)	0.87	0.89	0.78	-
	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	CAUTION : PHF below 0.9	

17 394

27

Bay 629

N

5 894 451

Emb

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File Name : The Embarcadero_Bay_4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	The Embarcadero (SB)					Bay St (WB)					The Embarcadero (NB)					Bay St (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
04:00 PM	5	127	0	2	134	0	0	0	0	0	0	108	164	1	273	129	0	2	0	131	538
04:15 PM	1	122	0	2	125	0	0	0	0	0	0	114	242	3	359	139	0	4	0	143	627
04:30 PM	3	99	0	1	103	0	0	0	0	0	0	94	203	2	299	103	0	3	0	106	508
04:45 PM	2	131	0	1	134	0	0	0	0	0	0	109	221	1	331	133	0	6	0	139	604
Total	11	479	0	6	496	0	0	0	0	0	0	425	830	7	1262	504	0	15	0	519	2277
05:00 PM	0	124	0	1	125	0	0	0	0	0	0	109	296	3	408	162	0	0	0	162	695
05:15 PM	0	111	0	3	114	0	0	0	0	0	0	108	357	2	467	187	0	1	0	188	769
05:30 PM	1	153	0	2	156	0	0	0	0	0	0	132	385	3	520	208	0	1	0	209	885
05:45 PM	1	153	0	4	158	0	0	0	0	0	0	126	473	2	601	204	0	0	0	204	963
Total	2	541	0	10	553	0	0	0	0	0	0	475	1511	10	1996	761	0	2	0	763	3312
Grand Total	13	1020	0	16	1049	0	0	0	0	0	0	900	2341	17	3258	1265	0	17	0	1282	5589
Apprch %	1.2	97.2	0	1.5		0	0	0	0		0	27.6	71.9	0.5		98.7	0	1.3	0		
Total %	0.2	18.3	0	0.3	18.8	0	0	0	0	0	0	16.1	41.9	0.3	58.3	22.6	0	0.3	0	22.9	
Unshifted	13	1020	0	16	1049	0	0	0	0	0	0	900	2341	17	3258	1265	0	17	0	1282	5589
% Unshifted	100	100	0	100	100	0	0	0	0	0	0	100	100	100	100	100	0	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	The Embarcadero (SB)					Bay St (WB)					The Embarcadero (NB)					Bay St (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	124	0	1	125	0	0	0	0	0	0	109	296	3	408	162	0	0	0	162	695
05:15 PM	0	111	0	3	114	0	0	0	0	0	0	108	357	2	467	187	0	1			
05:30 PM	1	153	0	2	156	0	0	0	0	0	0	132	385	3	520	208	0	1	0	209	885
05:45 PM	1	153	0	4	158	0	0	0	0	0	0	126	473	2	601	204	0	0	0	204	963
Total Volume	2	541	0	10	553	0	0	0	0	0	0	475	1511	10	1996	761	0	2	0	763	3312
% App. Total	0.4	97.8	0	1.8		0	0	0	0		0	23.8	75.7	0.5		99.7	0	0.3	0		
PHF	.500	.884	.000	.625	.875	.000	.000	.000	.000	.000	.000	.900	.799	.833	.830	.915	.000	.500	.000	.913	.860

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File Name : The Embarcadero_Bay_4_6pm
Site Code : 00000004
Start Date : 1/16/2008
Page No : 2

	The Embarcadero (SB)					Bay St (WB)					The Embarcadero (NB)					Bay St (EB)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	05:00 PM					04:00 PM					05:00 PM					05:00 PM					
+0 mins.	0	124	0	1	125	0	0	0	0	0	0	109	296	**3**	408	162	0	0	0	162	
+15 mins.	0	111	0	3	114	0	0	0	0	0	0	108	357	2	467	187	0	**1**			
+30 mins.	**1**	**153**	**0**	**2**	**156**	**0**	**0**	**0**	**0**	**0**	**0**	**132**	385	3	520	**208**	0	1	0	**209**	
+45 mins.	1	153	0	**4**	**158**	0	0	0	0	0	0	126	**473**	2	**601**	204	0	0	0	204	
Total Volume	2	541	0	10	553	0	0	0	0	0	0	475	1511	10	1996	761	0	2	0	763	
% App. Total	0.4	97.8	0	1.8		0	0	0	0		0	23.8	75.7	0.5		99.7	0	0.3	0		
PHF	.500	.884	.000	.625	.875	.000	.000	.000	.000	.000	.000	.900	.799	.833	.830	.915	.000	.500	.000	.913	

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File Name : The Embarcadero_Bay_12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Embarcadero (southbound)					Bay (westbound)					Embarcadero (northbound)					Bay (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
12:15 PM	10	136	0	0	146	0	0	0	0	0	0	262	120	1	383	137	0	7	1	145	674
12:30 PM	18	102	0	3	123	0	0	0	0	0	0	243	114	5	362	121	0	2	0	123	608
12:45 PM	11	79	0	4	94	0	0	0	0	0	0	246	113	1	360	137	0	5	0	142	596
Total	39	317	0	7	363	0	0	0	0	0	0	751	347	7	1105	395	0	14	1	410	1878
01:00 PM	13	92	0	2	107	0	0	0	0	0	0	244	127	3	374	122	0	14	2	138	619
01:15 PM	13	113	0	2	128	0	0	0	0	0	0	216	145	2	363	152	0	7	0	159	650
01:30 PM	14	106	0	2	122	0	0	0	0	0	1	248	139	4	392	90	0	10	0	100	614
01:45 PM	12	124	0	2	138	0	0	0	0	0	0	197	159	1	357	121	0	4	0	125	620
Total	52	435	0	8	495	0	0	0	0	0	1	905	570	10	1486	485	0	35	2	522	2503
02:00 PM	12	122	0	1	135	0	0	0	0	0	0	251	139	3	393	98	0	6	0	104	632
02:15 PM	20	135	0	2	157	0	0	0	0	0	0	196	131	1	328	130	0	15	0	145	630
Grand Total	123	1009	0	18	1150	0	0	0	0	0	1	2103	1187	21	3312	1108	0	70	3	1181	5643
Apprch %	10.7	87.7	0	1.6		0	0	0	0		0	63.5	35.8	0.6		93.8	0	5.9	0.3		
Total %	2.2	17.9	0	0.3	20.4	0	0	0	0	0	0	37.3	21	0.4	58.7	19.6	0	1.2	0.1	20.9	
Unshifted	123	1009	0	18	1150	0	0	0	0	0	1	2103	1187	21	3312	1108	0	70	3	1181	5643
% Unshifted	100	100	0	100	100	0	0	0	0	0	100	100	100	100	100	100	0	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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File Name : The Embarcadero_Bay_12pm_230pm
Site Code : 00000001
Start Date : 2/16/2008
Page No : 3

	Embarcadero (southbound)					Bay (westbound)					Embarcadero (northbound)					Bay (eastbound)					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:15 PM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:15 PM																					
01:15 PM	13	113	0	**2**	128	0	0	0	0	0	0	216	145	2	363	**152**	0	7	0	**159**	**650**
01:30 PM	**14**	106	0	2	122	0	0	0	0	0	**1**			**4**	392	90	0	**10**			
01:45 PM	**12**	**124**	**0**	**2**	**138**	0	0	0	0	0	0	197	**159**	1	357	121	0	4	0	125	620
02:00 PM	12	122	0	1	135	0	0	0	0	0	0	**251**	139	3	**393**	98	0	6	0	104	632
Total Volume	51	465	0	7	523	0	0	0	0	0	1	912	582	10	1505	461	0	27	0	488	2516
% App. Total	9.8	88.9	0	1.3		0	0	0	0		0.1	60.6	38.7	0.7		94.5	0	5.5	0		
PHF	.911	.938	.000	.875	.947	.000	.000	.000	.000	.000	.250	.908	.915	.625	.957	.758	.000	.675	.000	.767	.968

TRANSPORTATION-CIRCULATION

Level of Service Calculation Sheets

A. Existing Weekday Conditions (Table 3.4-2)

1. Jefferson Street and Jones Street
2. Beach Street and Jones Street
3. Beach Street and Hyde Street
4. Jefferson Street and Leavenworth Street
5. Beach Street and Leavenworth Street
6. Beach Street and Larkin Street
7. Beach Street and Polk Street
8. Beach Street and Columbus Avenue

B. Existing Weekend Conditions (Table 3.4-3)

1. Jefferson Street and Jones Street
2. Beach Street and Jones Street
3. Beach Street and Hyde Street
4. Jefferson Street and Leavenworth Street
5. Beach Street and Leavenworth Street
6. Beach Street and Larkin Street
7. Beach Street and Polk Street
8. Beach Street and Columbus Avenue

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	58	228	58	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.5	3.5	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				0.99	0.95	
Satd. Flow (prot)				3504	1770	
Flt Permitted				0.99	0.95	
Satd. Flow (perm)				3504	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	63	248	63	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	311	63	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)				26.0	15.0	
Effective Green, g (s)				26.0	15.0	
Actuated g/C Ratio				0.35	0.20	
Clearance Time (s)				3.5	3.5	
Lane Grp Cap (vph)				1215	354	
v/s Ratio Prot					c0.04	
v/s Ratio Perm				0.09		
v/c Ratio				0.26	0.18	
Uniform Delay, d1				17.6	24.9	
Progression Factor				1.00	1.20	
Incremental Delay, d2				0.5	1.1	
Delay (s)				18.1	30.9	
Level of Service				B	C	
Approach Delay (s)	0.0			18.1	30.9	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	20.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	187	17	9	133	14	22	30	15	9	32	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.95			0.95			0.90	
Flpb, ped/bikes		0.98			0.99			0.87			0.97	
Frt		0.99			0.99			0.97			0.97	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		3357			1730			1478			1566	
Flt Permitted		0.95			0.98			0.92			0.96	
Satd. Flow (perm)		3182			1708			1375			1519	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	203	18	10	145	15	24	33	16	10	35	13
RTOR Reduction (vph)	0	7	0	0	5	0	0	12	0	0	10	0
Lane Group Flow (vph)	0	224	0	0	165	0	0	61	0	0	48	0
Confl. Peds. (#/hr)	260		110	110		260	180		150	150		180
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		45.5			45.5			18.5			18.5	
Effective Green, g (s)		45.5			45.5			18.5			18.5	
Actuated g/C Ratio		0.61			0.61			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		1930			1036			339			375	
v/s Ratio Prot												
v/s Ratio Perm		0.07			c0.10			c0.04			0.03	
v/c Ratio		0.12			0.16			0.18			0.13	
Uniform Delay, d1		6.2			6.4			22.3			22.0	
Progression Factor		1.00			1.00			1.00			2.04	
Incremental Delay, d2		0.1			0.3			1.2			0.7	
Delay (s)		6.4			6.8			23.4			45.5	
Level of Service		A			A			C			D	
Approach Delay (s)		6.4			6.8			23.4			45.5	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations									
Volume (vph)	140	22	22	155	58	84	82	86	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	0.95			1.00	1.00	0.95	0.95		1.00
Frpb, ped/bikes	0.92			1.00	0.73	1.00	0.74		1.00
Flpb, ped/bikes	1.00			0.95	1.00	0.66	0.98		1.00
Frt	0.98			1.00	0.86	1.00	0.93		0.86
Flt Protected	1.00			0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	3206			1753	1172	1114	1196		1611
Flt Permitted	1.00			0.96	1.00	0.95	1.00		1.00
Satd. Flow (perm)	3206			1691	1172	1114	1196		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	24	24	168	63	91	89	93	9
RTOR Reduction (vph)	14	0	0	0	39	0	0	0	0
Lane Group Flow (vph)	162	0	0	192	24	82	191	0	9
Confl. Peds. (#/hr)		300	300		340	340		250	
Turn Type			Perm		custom	Perm			custom
Protected Phases	2			2			8		1
Permitted Phases			2		4	8			1
Actuated Green, G (s)	21.7			21.7	20.9	20.9	20.9		0.7
Effective Green, g (s)	21.7			21.7	20.9	20.9	20.9		0.7
Actuated g/C Ratio	0.40			0.40	0.38	0.38	0.38		0.01
Clearance Time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	1277			673	449	427	459		21
v/s Ratio Prot	0.05								c0.01
v/s Ratio Perm				c0.11	0.02	0.07	0.16		
v/c Ratio	0.13			0.29	0.05	0.19	0.42		0.43
Uniform Delay, d1	10.4			11.1	10.6	11.2	12.3		26.7
Progression Factor	1.00			1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.2			1.1	0.1	0.2	0.6		13.4
Delay (s)	10.6			12.2	10.6	11.4	12.9		40.1
Level of Service	B			B	B	B	B		D
Approach Delay (s)	10.6			12.2			12.5		
Approach LOS	B			B			B		

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	54.5	Sum of lost time (s)	11.2
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	78	208	0	88	14	0	0	15	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	85	226	0	96	15	0	0	16	2

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	198	113	111	18
Volume Left (vph)	85	0	96	0
Volume Right (vph)	0	0	0	2
Hadj (s)	0.25	0.03	0.21	-0.04
Departure Headway (s)	5.1	4.9	4.9	4.8
Degree Utilization, x	0.28	0.15	0.15	0.02
Capacity (veh/h)	694	719	702	704
Control Delay (s)	8.8	7.5	8.7	7.9
Approach Delay (s)	8.4		8.7	7.9
Approach LOS	A		A	A

Intersection Summary			
Delay	8.4		
HCM Level of Service	A		
Intersection Capacity Utilization	32.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	64	143	10	38	124	10	8	33	24	41	48	9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	70	155	11	41	135	11	9	36	26	45	52	10

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	147	89	187	71	107
Volume Left (vph)	70	0	41	9	45
Volume Right (vph)	0	11	11	26	10
Hadj (s)	0.27	-0.05	0.04	-0.16	0.06
Departure Headway (s)	5.4	5.1	4.8	4.9	5.1
Degree Utilization, x	0.22	0.13	0.25	0.10	0.15
Capacity (veh/h)	633	677	713	666	648
Control Delay (s)	8.7	7.6	9.4	8.4	9.0
Approach Delay (s)	8.3		9.4	8.4	9.0
Approach LOS	A		A	A	A

Intersection Summary			
Delay	8.8		
HCM Level of Service	A		
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	82	21	66	173	25	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	23	72	188	27	82

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	112	260	109
Volume Left (vph)	0	72	27
Volume Right (vph)	23	0	82
Hadj (s)	-0.09	0.09	-0.37
Departure Headway (s)	4.3	4.4	4.4
Degree Utilization, x	0.14	0.32	0.13
Capacity (veh/h)	796	796	762
Control Delay (s)	8.0	9.4	8.0
Approach Delay (s)	8.0	9.4	8.0
Approach LOS	A	A	A

Intersection Summary			
Delay	8.7		
HCM Level of Service	A		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	22	32	178	15	15	76
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	24	35	193	16	16	83

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	59	210	99
Volume Left (vph)	0	193	16
Volume Right (vph)	35	0	83
Hadj (s)	-0.32	0.22	-0.43
Departure Headway (s)	4.0	4.4	4.1
Degree Utilization, x	0.07	0.26	0.11
Capacity (veh/h)	861	791	828
Control Delay (s)	7.3	8.9	7.6
Approach Delay (s)	7.3	8.9	7.6
Approach LOS	A	A	A

Intersection Summary			
Delay	8.3		
HCM Level of Service	A		
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	187	97	21	125	47	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	203	105	23	136	51	33

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	136	173	159	84
Volume Left (vph)	0	0	23	51
Volume Right (vph)	0	105	0	33
Hadj (s)	0.03	-0.39	0.06	-0.08
Departure Headway (s)	4.9	4.5	4.6	4.8
Degree Utilization, x	0.18	0.21	0.20	0.11
Capacity (veh/h)	723	788	758	689
Control Delay (s)	7.8	7.5	8.7	8.4
Approach Delay (s)	7.6		8.7	8.4
Approach LOS	A		A	A

Intersection Summary			
Delay	8.1		
HCM Level of Service	A		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	181	430	121	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.5	3.5	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				0.99	0.95	
Satd. Flow (prot)				3487	1770	
Flt Permitted				0.99	0.95	
Satd. Flow (perm)				3487	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	197	467	132	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	664	132	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)				26.0	15.0	
Effective Green, g (s)				26.0	15.0	
Actuated g/C Ratio				0.35	0.20	
Clearance Time (s)				3.5	3.5	
Lane Grp Cap (vph)				1209	354	
v/s Ratio Prot					c0.07	
v/s Ratio Perm				0.19		
v/c Ratio				0.55	0.37	
Uniform Delay, d1				19.8	25.9	
Progression Factor				1.00	1.07	
Incremental Delay, d2				1.8	2.4	
Delay (s)				21.6	30.0	
Level of Service				C	C	
Approach Delay (s)	0.0			21.6	30.0	
Approach LOS	A			C	C	

Intersection Summary			
HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	412	99	33	229	21	109	61	45	61	68	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		0.95			1.00			1.00			1.00	
Frpb, ped/bikes		0.91			0.95			0.93			0.83	
Flpb, ped/bikes		0.97			0.98			0.83			0.94	
Frt		0.97			0.99			0.97			0.96	
Flt Protected		1.00			0.99			0.98			0.98	
Satd. Flow (prot)		3015			1703			1358			1376	
Flt Permitted		0.90			0.90			0.70			0.83	
Satd. Flow (perm)		2730			1547			969			1159	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	448	108	36	249	23	118	66	49	66	74	58
RTOR Reduction (vph)	0	24	0	0	4	0	0	13	0	0	20	0
Lane Group Flow (vph)	0	585	0	0	304	0	0	220	0	0	178	0
Confl. Peds. (#/hr)	528		226	226		528	367		293	293		367
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		45.5			45.5			18.5			18.5	
Effective Green, g (s)		45.5			45.5			18.5			18.5	
Actuated g/C Ratio		0.61			0.61			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		1656			939			239			286	
v/s Ratio Prot												
v/s Ratio Perm		c0.21			0.20			c0.23			0.15	
v/c Ratio		0.35			0.32			0.92			0.62	
Uniform Delay, d1		7.4			7.2			27.5			25.2	
Progression Factor		1.00			1.00			1.00			1.79	
Incremental Delay, d2		0.6			0.9			40.9			8.4	
Delay (s)		8.0			8.1			68.5			53.4	
Level of Service		A			A			E			D	
Approach Delay (s)		8.0			8.1			68.5			53.4	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM Average Control Delay	25.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations									
Volume (vph)	308	64	42	237	134	255	164	215	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	0.95			1.00	1.00	0.95	0.95		1.00
Frpb, ped/bikes	0.88			1.00	0.69	1.00	0.63		1.00
Flpb, ped/bikes	1.00			0.95	1.00	0.58	0.97		1.00
Frt	0.97			1.00	0.86	1.00	0.92		0.86
Flt Protected	1.00			0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	3033			1750	1113	974	991		1611
Flt Permitted	1.00			0.89	1.00	0.95	1.00		1.00
Satd. Flow (perm)	3033			1573	1113	974	991		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	70	46	258	146	277	178	234	9
RTOR Reduction (vph)	25	0	0	0	68	0	0	0	0
Lane Group Flow (vph)	380	0	0	304	78	249	440	0	9
Confl. Peds. (#/hr)		542	542		563	563		552	
Turn Type			Perm		custom	Perm			custom
Protected Phases	2			2			8		1
Permitted Phases			2		4	8			1
Actuated Green, G (s)	16.6			16.6	32.4	32.4	32.4		0.7
Effective Green, g (s)	16.6			16.6	32.4	32.4	32.4		0.7
Actuated g/C Ratio	0.27			0.27	0.53	0.53	0.53		0.01
Clearance Time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	827			429	592	518	527		19
v/s Ratio Prot	0.13								c0.01
v/s Ratio Perm				c0.19	0.07	0.26	0.44		
v/c Ratio	0.46			0.71	0.13	0.48	0.83		0.47
Uniform Delay, d1	18.4			20.0	7.2	9.0	12.0		29.9
Progression Factor	1.00			1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	1.8			9.5	0.1	0.7	11.0		17.5
Delay (s)	20.3			29.5	7.3	9.7	23.0		47.4
Level of Service	C			C	A	A	C		D
Approach Delay (s)	20.3			29.5			18.2		
Approach LOS	C			C			B		

Intersection Summary			
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.9	Sum of lost time (s)	11.2
Intersection Capacity Utilization	69.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	0	0	0	98	427	7	100	10	0	0	25	6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	107	464	8	109	11	0	0	27	7

Direction, Lane #	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	339	240	120	34
Volume Left (vph)	107	0	109	0
Volume Right (vph)	0	8	0	7
Hadj (s)	0.19	0.01	0.22	-0.08
Departure Headway (s)	5.1	4.9	5.4	5.3
Degree Utilization, x	0.48	0.33	0.18	0.05
Capacity (veh/h)	683	713	628	632
Control Delay (s)	11.6	9.2	9.6	8.5
Approach Delay (s)	10.6		9.6	8.5
Approach LOS	B		A	A

Intersection Summary			
Delay	10.3		
HCM Level of Service	B		
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	126	377	45	88	244	58	15	83	118	69	46	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	137	410	49	96	265	63	16	90	128	75	50	13

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total (vph)	342	254	424	235	138
Volume Left (vph)	137	0	96	16	75
Volume Right (vph)	0	49	63	128	13
Hadj (s)	0.23	-0.10	-0.01	-0.28	0.09
Departure Headway (s)	6.9	6.5	6.3	6.8	7.5
Degree Utilization, x	0.65	0.46	0.75	0.44	0.29
Capacity (veh/h)	507	534	546	476	421
Control Delay (s)	20.7	13.8	25.7	15.0	13.5
Approach Delay (s)	17.8		25.7	15.0	13.5
Approach LOS	C		D	C	B

Intersection Summary			
Delay	19.3		
HCM Level of Service	C		
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	212	78	167	291	66	169
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	230	85	182	316	72	184

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	315	498	255
Volume Left (vph)	0	182	72
Volume Right (vph)	85	0	184
Hadj (s)	-0.13	0.11	-0.34
Departure Headway (s)	5.3	5.2	5.6
Degree Utilization, x	0.46	0.73	0.40
Capacity (veh/h)	649	670	582
Control Delay (s)	12.7	20.8	12.3
Approach Delay (s)	12.7	20.8	12.3
Approach LOS	B	C	B

Intersection Summary			
Delay	16.4		
HCM Level of Service	C		
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	48	37	306	46	41	252
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	40	333	50	45	274

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	92	383	318
Volume Left (vph)	0	333	45
Volume Right (vph)	40	0	274
Hadj (s)	-0.23	0.21	-0.45
Departure Headway (s)	5.0	5.0	4.7
Degree Utilization, x	0.13	0.54	0.41
Capacity (veh/h)	657	684	715
Control Delay (s)	8.7	13.7	10.9
Approach Delay (s)	8.7	13.7	10.9
Approach LOS	A	B	B

Intersection Summary			
Delay	12.0		
HCM Level of Service	B		
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↱			↰↑	Y	
Sign Control	Stop			Stop	Stop	
Volume (vph)	472	219	46	213	66	76
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	513	238	50	232	72	83

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	342	409	282	154
Volume Left (vph)	0	0	50	72
Volume Right (vph)	0	238	0	83
Hadj (s)	0.03	-0.37	0.07	-0.19
Departure Headway (s)	5.3	4.9	5.3	5.7
Degree Utilization, x	0.50	0.56	0.41	0.25
Capacity (veh/h)	661	724	661	569
Control Delay (s)	12.4	12.6	11.9	10.6
Approach Delay (s)	12.5		11.9	10.6
Approach LOS	B		B	B

Intersection Summary			
Delay	12.1		
HCM Level of Service	B		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

Level of Service Calculation Sheets

C. Existing Plus Project Weekday Conditions (Table 4.4-1)
(Semi-Exclusive and Shared Lane Options)

1. Jefferson Street and Jones Street
2. Beach Street and Jones Street
3. Beach Street and Hyde Street
4. Jefferson Street and Leavenworth Street
5. Beach Street and Leavenworth Street
6. Beach Street and Larkin Street
7. Beach Street and Polk Street
8. Beach Street and Columbus Avenue

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations			↰	↑	↰	
Volume (vph)	0	0	58	228	58	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.5	3.5	3.5	
Lane Util. Factor			1.00	1.00	1.00	
Frt			1.00	1.00	1.00	
Flt Protected			0.95	1.00	0.95	
Satd. Flow (prot)			1770	1863	1770	
Flt Permitted			0.95	1.00	0.95	
Satd. Flow (perm)			1770	1863	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	63	248	63	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	63	248	63	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)			26.0	26.0	15.0	
Effective Green, g (s)			26.0	26.0	15.0	
Actuated g/C Ratio			0.35	0.35	0.20	
Clearance Time (s)			3.5	3.5	3.5	
Lane Grp Cap (vph)			614	646	354	
v/s Ratio Prot				c0.13	c0.04	
v/s Ratio Perm			0.04			
v/c Ratio			0.10	0.38	0.18	
Uniform Delay, d1			16.6	18.5	24.9	
Progression Factor			1.00	1.00	1.17	
Incremental Delay, d2			0.3	1.7	1.1	
Delay (s)			16.9	20.2	30.1	
Level of Service			B	C	C	
Approach Delay (s)	0.0			19.5	30.1	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	22.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↰↑	↰	
Volume (vph)	0	0	58	228	58	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.5	3.5	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				0.99	0.95	
Satd. Flow (prot)				3504	1770	
Flt Permitted				0.99	0.95	
Satd. Flow (perm)				3504	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	63	248	63	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	311	63	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)				26.0	15.0	
Effective Green, g (s)				26.0	15.0	
Actuated g/C Ratio				0.35	0.20	
Clearance Time (s)				3.5	3.5	
Lane Grp Cap (vph)				1215	354	
v/s Ratio Prot					c0.04	
v/s Ratio Perm				0.09		
v/c Ratio				0.26	0.18	
Uniform Delay, d1				17.6	24.9	
Progression Factor				1.00	1.29	
Incremental Delay, d2				0.5	1.1	
Delay (s)				18.1	33.1	
Level of Service				B	C	
Approach Delay (s)	0.0			18.1	33.1	
Approach LOS	A			B	C	

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	187	17	9	133	14	22	30	15	9	32	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.98			0.95			0.92			0.90	
Flpb, ped/bikes		0.98			0.99			0.87			0.95	
Frt		0.99			0.99			0.97			0.97	
Flt Protected		1.00			1.00			0.98			0.99	
Satd. Flow (prot)		1769			1731			1428			1531	
Flt Permitted		0.99			0.98			0.92			0.96	
Satd. Flow (perm)		1755			1710			1329			1486	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	203	18	10	145	15	24	33	16	10	35	13
RTOR Reduction (vph)	0	4	0	0	5	0	0	12	0	0	10	0
Lane Group Flow (vph)	0	227	0	0	165	0	0	61	0	0	48	0
Confl. Peds. (#/hr)	260		110	110		260	180		150	150		180
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		45.5			45.5			18.5			18.5	
Effective Green, g (s)		45.5			45.5			18.5			18.5	
Actuated g/C Ratio		0.61			0.61			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		1065			1037			328			367	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.10			c0.05			0.03	
v/c Ratio		0.21			0.16			0.19			0.13	
Uniform Delay, d1		6.7			6.4			22.3			22.0	
Progression Factor		0.51			1.00			1.00			2.09	
Incremental Delay, d2		0.4			0.3			1.2			0.7	
Delay (s)		3.8			6.8			23.6			46.8	
Level of Service		A			A			C			D	
Approach Delay (s)		3.8			6.8			23.6			46.8	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.20		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	9	187	17	9	133	14	22	30	15	9	32	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.73		0.95			0.92			0.90	
Flpb, ped/bikes		0.98	1.00		0.99			0.87			0.95	
Frt		1.00	0.85		0.99			0.97			0.97	
Flt Protected		1.00	1.00		1.00			0.98			0.99	
Satd. Flow (prot)		1823	1152		1729			1428			1531	
Flt Permitted		0.99	1.00		0.99			0.92			0.96	
Satd. Flow (perm)		1808	1152		1709			1329			1486	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	203	18	10	145	15	24	33	16	10	35	13
RTOR Reduction (vph)	0	0	7	0	5	0	0	12	0	0	10	0
Lane Group Flow (vph)	0	213	11	0	165	0	0	61	0	0	48	0
Confl. Peds. (#/hr)	260		110	110		260	180		150	150		180
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		45.5	45.5		45.5			18.5			18.5	
Effective Green, g (s)		45.5	45.5		45.5			18.5			18.5	
Actuated g/C Ratio		0.61	0.61		0.61			0.25			0.25	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		1097	699		1037			328			367	
v/s Ratio Prot												
v/s Ratio Perm		c0.12	0.01		0.10			c0.05			0.03	
v/c Ratio		0.19	0.02		0.16			0.19			0.13	
Uniform Delay, d1		6.6	5.9		6.4			22.3			22.0	
Progression Factor		0.63	0.42		1.00			1.00			2.04	
Incremental Delay, d2		0.4	0.0		0.3			1.2			0.7	
Delay (s)		4.5	2.5		6.8			23.6			45.6	
Level of Service		A	A		A			C			D	
Approach Delay (s)		4.4			6.8			23.6			45.6	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations									
Volume (vph)	140	22	22	155	58	84	82	86	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	1.00			1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	0.92			1.00	0.73	1.00	0.73		1.00
Flpb, ped/bikes	1.00			0.95	1.00	0.66	1.00		1.00
Frt	0.98			1.00	0.86	1.00	0.92		0.86
Flt Protected	1.00			0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	1691			1753	1172	1172	1255		1611
Flt Permitted	1.00			0.96	1.00	0.95	1.00		1.00
Satd. Flow (perm)	1691			1693	1172	1172	1255		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	24	24	168	63	91	89	93	9
RTOR Reduction (vph)	7	0	0	0	39	0	0	0	0
Lane Group Flow (vph)	169	0	0	192	24	91	182	0	9
Confl. Peds. (#/hr)		300	300		340	340		250	
Turn Type			Perm		custom	Perm			custom
Protected Phases	2			2			8		1
Permitted Phases			2		4	8			1
Actuated Green, G (s)	21.7			21.7	20.9	20.9	20.9		0.7
Effective Green, g (s)	21.7			21.7	20.9	20.9	20.9		0.7
Actuated g/C Ratio	0.40			0.40	0.38	0.38	0.38		0.01
Clearance Time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	673			674	449	449	481		21
v/s Ratio Prot	0.10						c0.15		c0.01
v/s Ratio Perm				c0.11	0.02	0.08			
v/c Ratio	0.25			0.28	0.05	0.20	0.38		0.43
Uniform Delay, d1	11.0			11.1	10.6	11.2	12.1		26.7
Progression Factor	1.00			1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.9			1.1	0.1	0.2	0.5		13.4
Delay (s)	11.9			12.2	10.6	11.5	12.6		40.1
Level of Service	B			B	B	B	B		D
Approach Delay (s)	11.9			12.2			12.2		
Approach LOS	B			B			B		

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	54.5	Sum of lost time (s)	11.2
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations								
Volume (vph)	162	22	155	58	84	82	86	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6		3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00		1.00	0.73	1.00	0.73		1.00
Flpb, ped/bikes	1.00		0.95	1.00	0.66	1.00		1.00
Frt	1.00		1.00	0.86	1.00	0.92		0.86
Flt Protected	1.00		0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	1863		1753	1172	1172	1255		1611
Flt Permitted	1.00		0.96	1.00	0.95	1.00		1.00
Satd. Flow (perm)	1863		1693	1172	1172	1255		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	24	168	63	91	89	93	9
RTOR Reduction (vph)	0	0	0	39	0	0	0	0
Lane Group Flow (vph)	176	0	192	24	91	182	0	9
Confl. Peds. (#/hr)		300		340	340		250	
Turn Type		Perm		custom	Perm			custom
Protected Phases	2		2			8		1
Permitted Phases		2		4	8			1
Actuated Green, G (s)	21.7		21.7	20.9	20.9	20.9		0.7
Effective Green, g (s)	21.7		21.7	20.9	20.9	20.9		0.7
Actuated g/C Ratio	0.40		0.40	0.38	0.38	0.38		0.01
Clearance Time (s)	3.6		3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	742		674	449	449	481		21
v/s Ratio Prot	0.09					c0.15		c0.01
v/s Ratio Perm			c0.11	0.02	0.08			
v/c Ratio	0.24		0.28	0.05	0.20	0.38		0.43
Uniform Delay, d1	10.9		11.1	10.6	11.2	12.1		26.7
Progression Factor	1.00		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.8		1.1	0.1	0.2	0.5		13.4
Delay (s)	11.7		12.2	10.6	11.5	12.6		40.1
Level of Service	B		B	B	B	B		D
Approach Delay (s)	11.7		12.2			12.2		
Approach LOS	B		B			B		

Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	54.5	Sum of lost time (s)	11.2
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	78	208	0	88	14	0	0	15	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					3.5			3.5			3.5	
Lane Util. Factor					1.00			1.00			1.00	
Frpb, ped/bikes					1.00			1.00			0.98	
Flpb, ped/bikes					0.78			0.84			1.00	
Frt					1.00			1.00			0.98	
Flt Protected					0.99			0.96			1.00	
Satd. Flow (prot)					1432			1503			1793	
Flt Permitted					0.99			0.74			1.00	
Satd. Flow (perm)					1432			1164			1793	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	85	226	0	96	15	0	0	16	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	0	0	0	311	0	0	111	0	0	16	0
Confl. Peds. (#/hr)				870		570	80					80
Turn Type				Perm			Perm					
Protected Phases					8			2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					21.5			12.5			12.5	
Effective Green, g (s)					21.5			12.5			12.5	
Actuated g/C Ratio					0.29			0.17			0.17	
Clearance Time (s)					3.5			3.5			3.5	
Lane Grp Cap (vph)					411			194			299	
v/s Ratio Prot											0.01	
v/s Ratio Perm					0.22			c0.10				
v/c Ratio					0.76			0.57			0.05	
Uniform Delay, d1					24.4			28.8			26.3	
Progression Factor					0.86			1.11			1.00	
Incremental Delay, d2					11.8			11.5			0.3	
Delay (s)					32.6			43.3			26.6	
Level of Service					C			D			C	
Approach Delay (s)		0.0			32.6			43.3			26.6	
Approach LOS		A			C			D			C	

Intersection Summary			
HCM Average Control Delay	35.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	41.0
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	78	208	0	88	14	0	0	15	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					3.5			3.5			3.5	
Lane Util. Factor					1.00			1.00			1.00	
Frpb, ped/bikes					1.00			1.00			0.98	
Flpb, ped/bikes					0.78			0.84			1.00	
Frt					1.00			1.00			0.98	
Flt Protected					0.99			0.96			1.00	
Satd. Flow (prot)					1432			1503			1793	
Flt Permitted					0.99			0.74			1.00	
Satd. Flow (perm)					1432			1164			1793	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	85	226	0	96	15	0	0	16	2
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	2	0
Lane Group Flow (vph)	0	0	0	0	311	0	0	111	0	0	16	0
Confl. Peds. (#/hr)				870		570	80					80
Turn Type				Perm			Perm					
Protected Phases					8			2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					21.5			12.5			12.5	
Effective Green, g (s)					21.5			12.5			12.5	
Actuated g/C Ratio					0.29			0.17			0.17	
Clearance Time (s)					3.5			3.5			3.5	
Lane Grp Cap (vph)					411			194			299	
v/s Ratio Prot											0.01	
v/s Ratio Perm					0.22			c0.10				
v/c Ratio					0.76			0.57			0.05	
Uniform Delay, d1					24.4			28.8			26.3	
Progression Factor					0.89			1.23			1.00	
Incremental Delay, d2					12.1			11.1			0.3	
Delay (s)					33.7			46.4			26.6	
Level of Service					C			D			C	
Approach Delay (s)		0.0			33.7			46.4			26.6	
Approach LOS		A			C			D			C	

Intersection Summary			
HCM Average Control Delay	36.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	41.0
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Volume (vph)	64	143	10	38	124	10	8	33	24	41	48	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			0.99			0.87			0.97	
Flpb, ped/bikes		0.96			0.98			0.97			0.87	
Frt		0.99			0.99			0.95			0.99	
Flt Protected		0.99			0.99			0.99			0.98	
Satd. Flow (prot)		1731			1767			1485			1529	
Flt Permitted		0.87			0.91			0.97			0.86	
Satd. Flow (perm)		1533			1622			1444			1342	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	70	155	11	41	135	11	9	36	26	45	52	10
RTOR Reduction (vph)	0	2	0	0	3	0	0	21	0	0	5	0
Lane Group Flow (vph)	0	234	0	0	184	0	0	50	0	0	102	0
Confl. Peds. (#/hr)	210		150	150		210	110		140	140		110
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		40.0			40.0			15.0			15.0	
Effective Green, g (s)		40.0			40.0			15.0			15.0	
Actuated g/C Ratio		0.53			0.53			0.20			0.20	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		818			865			289			268	
v/s Ratio Prot												
v/s Ratio Perm		c0.15			0.11			0.03			c0.08	
v/c Ratio		0.29			0.21			0.17			0.38	
Uniform Delay, d1		9.6			9.2			24.9			26.0	
Progression Factor		1.00			0.82			1.00			1.46	
Incremental Delay, d2		0.9			0.6			1.3			3.2	
Delay (s)		10.5			8.1			26.2			41.1	
Level of Service		B			A			C			D	
Approach Delay (s)		10.5			8.1			26.2			41.1	
Approach LOS		B			A			C			D	

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	64	143	10	38	124	10	8	33	24	41	48	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.98		1.00	0.96			0.92			0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.97			0.93	
Frt	1.00	0.99		1.00	0.99			0.95			0.99	
Flt Protected	0.95	1.00		0.95	1.00			0.99			0.98	
Satd. Flow (prot)	1770	1800		1770	1772			1586			1629	
Flt Permitted	0.95	1.00		0.95	1.00			0.97			0.86	
Satd. Flow (perm)	1770	1800		1770	1772			1542			1430	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	70	155	11	41	135	11	9	36	26	45	52	10
RTOR Reduction (vph)	0	4	0	0	4	0	0	21	0	0	5	0
Lane Group Flow (vph)	70	162	0	41	142	0	0	50	0	0	102	0
Confl. Peds. (#/hr)	210		150	150		210	110		140	140		110
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	6.0	30.0		6.0	30.0			15.0			15.0	
Effective Green, g (s)	6.0	30.0		6.0	30.0			15.0			15.0	
Actuated g/C Ratio	0.08	0.40		0.08	0.40			0.20			0.20	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	142	720		142	709			308			286	
v/s Ratio Prot	c0.04	c0.09		0.02	0.08							
v/s Ratio Perm								0.03			c0.07	
v/c Ratio	0.49	0.23		0.29	0.20			0.16			0.36	
Uniform Delay, d1	33.0	14.8		32.5	14.7			24.8			25.8	
Progression Factor	1.00	1.00		0.83	0.93			1.00			1.17	
Incremental Delay, d2	11.7	0.7		5.0	0.6			1.1			2.8	
Delay (s)	44.8	15.6		32.0	14.3			25.9			32.9	
Level of Service	D	B		C	B			C			C	
Approach Delay (s)		24.2			18.2			25.9			32.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	82	21	66	173	25	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	23	72	188	27	82

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	112	260	109
Volume Left (vph)	0	72	27
Volume Right (vph)	23	0	82
Hadj (s)	-0.09	0.09	-0.37
Departure Headway (s)	4.3	4.4	4.4
Degree Utilization, x	0.14	0.32	0.13
Capacity (veh/h)	796	796	762
Control Delay (s)	8.0	9.4	8.0
Approach Delay (s)	8.0	9.4	8.0
Approach LOS	A	A	A

Intersection Summary			
Delay	8.7		
HCM Level of Service	A		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	82	21	66	173	25	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	89	23	72	188	27	82

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	112	72	188	109
Volume Left (vph)	0	72	0	27
Volume Right (vph)	23	0	0	82
Hadj (s)	-0.09	0.53	0.03	-0.37
Departure Headway (s)	4.5	5.4	4.9	4.4
Degree Utilization, x	0.14	0.11	0.25	0.13
Capacity (veh/h)	780	647	718	764
Control Delay (s)	8.2	7.8	8.3	8.1
Approach Delay (s)	8.2	8.2		8.1
Approach LOS	A	A		A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	22	32	178	15	15	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.93			1.00	0.91	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.92			1.00	0.89	
Flt Protected	1.00			0.96	0.99	
Satd. Flow (prot)	1600			1781	1485	
Flt Permitted	1.00			0.96	0.99	
Satd. Flow (perm)	1600			1781	1485	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	35	193	16	16	83
RTOR Reduction (vph)	30	0	0	0	71	0
Lane Group Flow (vph)	29	0	0	209	28	0
Confl. Peds. (#/hr)		80	80		20	50
Turn Type			Split			
Protected Phases	4		8	8	2	
Permitted Phases						
Actuated Green, G (s)	11.0			27.0	11.0	
Effective Green, g (s)	11.0			27.0	11.0	
Actuated g/C Ratio	0.15			0.36	0.15	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	235			641	218	
v/s Ratio Prot	c0.02			c0.12	c0.02	
v/s Ratio Perm						
v/c Ratio	0.12			0.33	0.13	
Uniform Delay, d1	27.8			17.4	27.8	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.1			1.4	1.2	
Delay (s)	28.9			18.8	29.1	
Level of Service	C			B	C	
Approach Delay (s)	28.9			18.8	29.1	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	50.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	22	32	178	15	15	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.88			1.00	0.89	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.92			1.00	0.89	
Flt Protected	1.00			0.96	0.99	
Satd. Flow (prot)	1506			1781	1453	
Flt Permitted	1.00			0.96	0.99	
Satd. Flow (perm)	1506			1781	1453	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	35	193	16	16	83
RTOR Reduction (vph)	30	0	0	0	71	0
Lane Group Flow (vph)	29	0	0	209	28	0
Confl. Peds. (#/hr)		80	80		20	50
Turn Type			Split			
Protected Phases	4		8	8	2	
Permitted Phases						
Actuated Green, G (s)	11.0			27.0	11.0	
Effective Green, g (s)	11.0			27.0	11.0	
Actuated g/C Ratio	0.15			0.36	0.15	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	221			641	213	
v/s Ratio Prot	c0.02			c0.12	c0.02	
v/s Ratio Perm						
v/c Ratio	0.13			0.33	0.13	
Uniform Delay, d1	27.8			17.4	27.8	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	1.2			1.4	1.3	
Delay (s)	29.1			18.8	29.1	
Level of Service	C			B	C	
Approach Delay (s)	29.1			18.8	29.1	
Approach LOS	C			B	C	

Intersection Summary			
HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	37.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	187	97	21	125	47	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	203	105	23	136	51	33

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	203	105	159	84
Volume Left (vph)	0	0	23	51
Volume Right (vph)	0	105	0	33
Hadj (s)	0.03	-0.67	0.06	-0.08
Departure Headway (s)	4.9	4.2	4.6	4.8
Degree Utilization, x	0.28	0.12	0.20	0.11
Capacity (veh/h)	724	837	757	687
Control Delay (s)	8.5	6.6	8.8	8.4
Approach Delay (s)	7.9		8.8	8.4
Approach LOS	A		A	A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	187	119	21	125	47	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	203	129	23	136	51	33

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	203	129	159	84
Volume Left (vph)	0	0	23	51
Volume Right (vph)	0	129	0	33
Hadj (s)	0.03	-0.67	0.06	-0.08
Departure Headway (s)	4.9	4.2	4.6	4.9
Degree Utilization, x	0.28	0.15	0.20	0.11
Capacity (veh/h)	724	838	754	681
Control Delay (s)	8.5	6.7	8.8	8.5
Approach Delay (s)	7.8		8.8	8.5
Approach LOS	A		A	A

Intersection Summary			
Delay	8.2		
HCM Level of Service	A		
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

Level of Service Calculation Sheets

D. Existing Plus Project Weekend Conditions (Table 4.4-2)
(Semi-Exclusive and Shared Lane Options)

1. Jefferson Street and Jones Street
2. Beach Street and Jones Street
3. Beach Street and Hyde Street
4. Jefferson Street and Leavenworth Street
5. Beach Street and Leavenworth Street
6. Beach Street and Larkin Street
7. Beach Street and Polk Street
8. Beach Street and Columbus Avenue

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations			↰	↑	↰	
Volume (vph)	0	0	181	430	121	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)			3.5	3.5	3.5	
Lane Util. Factor			1.00	1.00	1.00	
Frt			1.00	1.00	1.00	
Flt Protected			0.95	1.00	0.95	
Satd. Flow (prot)			1770	1863	1770	
Flt Permitted			0.95	1.00	0.95	
Satd. Flow (perm)			1770	1863	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	197	467	132	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	197	467	132	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)			26.0	26.0	15.0	
Effective Green, g (s)			26.0	26.0	15.0	
Actuated g/C Ratio			0.35	0.35	0.20	
Clearance Time (s)			3.5	3.5	3.5	
Lane Grp Cap (vph)			614	646	354	
v/s Ratio Prot				c0.25	c0.07	
v/s Ratio Perm			0.11			
v/c Ratio			0.32	0.72	0.37	
Uniform Delay, d1			18.0	21.4	25.9	
Progression Factor			1.00	1.00	1.03	
Incremental Delay, d2			1.4	6.9	2.1	
Delay (s)			19.4	28.2	28.8	
Level of Service			B	C	C	
Approach Delay (s)	0.0			25.6	28.8	
Approach LOS	A			C	C	

Intersection Summary			
HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	0	0	181	430	121	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)				3.5	3.5	
Lane Util. Factor				0.95	1.00	
Frt				1.00	1.00	
Flt Protected				0.99	0.95	
Satd. Flow (prot)				3487	1770	
Flt Permitted				0.99	0.95	
Satd. Flow (perm)				3487	1770	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	197	467	132	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	664	132	0
Turn Type			Perm			
Protected Phases				2	4	
Permitted Phases			2			
Actuated Green, G (s)				26.0	15.0	
Effective Green, g (s)				26.0	15.0	
Actuated g/C Ratio				0.35	0.20	
Clearance Time (s)				3.5	3.5	
Lane Grp Cap (vph)				1209	354	
v/s Ratio Prot					c0.07	
v/s Ratio Perm				0.19		
v/c Ratio				0.55	0.37	
Uniform Delay, d1				19.8	25.9	
Progression Factor				1.00	1.16	
Incremental Delay, d2				1.8	2.3	
Delay (s)				21.6	32.4	
Level of Service				C	C	
Approach Delay (s)	0.0			21.6	32.4	
Approach LOS	A			C	C	

Intersection Summary			
HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	34.0
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	49	412	99	33	229	21	109	61	45	61	68	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.95			0.96			0.92			0.87	
Flpb, ped/bikes		0.97			0.99			0.87			0.94	
Frt		0.98			0.99			0.97			0.96	
Flt Protected		1.00			0.99			0.98			0.98	
Satd. Flow (prot)		1677			1744			1421			1439	
Flt Permitted		0.95			0.91			0.70			0.83	
Satd. Flow (perm)		1601			1592			1014			1212	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	448	108	36	249	23	118	66	49	66	74	58
RTOR Reduction (vph)	0	10	0	0	4	0	0	13	0	0	20	0
Lane Group Flow (vph)	0	599	0	0	304	0	0	220	0	0	178	0
Confl. Peds. (#/hr)	260		110	110		260	180		150	150		180
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		
Actuated Green, G (s)		45.5			45.5			18.5			18.5	
Effective Green, g (s)		45.5			45.5			18.5			18.5	
Actuated g/C Ratio		0.61			0.61			0.25			0.25	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		971			966			250			299	
v/s Ratio Prot												
v/s Ratio Perm		c0.37			0.19			c0.22			0.15	
v/c Ratio		0.62			0.31			0.88			0.60	
Uniform Delay, d1		9.3			7.2			27.2			25.0	
Progression Factor		0.46			1.00			1.00			1.87	
Incremental Delay, d2		1.9			0.9			33.0			8.2	
Delay (s)		6.2			8.0			60.1			54.9	
Level of Service		A			A			E			D	
Approach Delay (s)		6.2			8.0			60.1			54.9	
Approach LOS		A			A			E			D	

Intersection Summary			
HCM Average Control Delay	23.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	49	412	99	33	229	21	109	61	45	61	68	53
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.73		0.96			0.92			0.87	
Flpb, ped/bikes		0.97	1.00		0.99			0.87			0.94	
Frt		1.00	0.85		0.99			0.97			0.96	
Flt Protected		0.99	1.00		0.99			0.98			0.98	
Satd. Flow (prot)		1794	1152		1740			1421			1439	
Flt Permitted		0.94	1.00		0.92			0.70			0.83	
Satd. Flow (perm)		1696	1152		1612			1014			1212	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	53	448	108	36	249	23	118	66	49	66	74	58
RTOR Reduction (vph)	0	0	42	0	4	0	0	13	0	0	20	0
Lane Group Flow (vph)	0	501	66	0	304	0	0	220	0	0	178	0
Confl. Peds. (#/hr)	260		110	110		260	180		150	150		180
Turn Type	Perm		Perm	Perm			Perm			Perm		
Protected Phases		2			6			4			8	
Permitted Phases	2		2	6			4			8		
Actuated Green, G (s)		45.5	45.5		45.5			18.5			18.5	
Effective Green, g (s)		45.5	45.5		45.5			18.5			18.5	
Actuated g/C Ratio		0.61	0.61		0.61			0.25			0.25	
Clearance Time (s)		4.0	4.0		4.0			4.0			4.0	
Lane Grp Cap (vph)		1029	699		978			250			299	
v/s Ratio Prot												
v/s Ratio Perm		c0.30	0.06		0.19			c0.22			0.15	
v/c Ratio		0.49	0.09		0.31			0.88			0.60	
Uniform Delay, d1		8.2	6.2		7.2			27.2			25.0	
Progression Factor		1.18	2.70		1.00			1.00			1.79	
Incremental Delay, d2		1.2	0.2		0.8			33.0			7.2	
Delay (s)		11.0	16.8		8.0			60.1			51.9	
Level of Service		B	B		A			E			D	
Approach Delay (s)		12.0			8.0			60.1			51.9	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations									
Volume (vph)	308	64	42	237	134	255	164	215	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	1.00			1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	0.90			1.00	0.79	1.00	0.70		1.00
Flpb, ped/bikes	1.00			0.97	1.00	0.66	1.00		1.00
Frt	0.98			1.00	0.86	1.00	0.91		0.86
Flt Protected	1.00			0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	1643			1793	1277	1161	1184		1611
Flt Permitted	1.00			0.69	1.00	0.95	1.00		1.00
Satd. Flow (perm)	1643			1255	1277	1161	1184		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	70	46	258	146	277	178	234	9
RTOR Reduction (vph)	11	0	0	0	71	0	0	0	0
Lane Group Flow (vph)	394	0	0	304	75	277	412	0	9
Confl. Peds. (#/hr)		300	300		340	340		250	
Turn Type			Perm		custom	Perm			custom
Protected Phases	2			2			8		1
Permitted Phases			2		4	8			1
Actuated Green, G (s)	16.6			16.6	29.7	29.7	29.7		0.6
Effective Green, g (s)	16.6			16.6	29.7	29.7	29.7		0.6
Actuated g/C Ratio	0.29			0.29	0.51	0.51	0.51		0.01
Clearance Time (s)	3.6			3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	469			359	653	593	605		17
v/s Ratio Prot	0.24						c0.35		c0.01
v/s Ratio Perm				c0.24	0.06	0.24			
v/c Ratio	0.84			0.85	0.11	0.47	0.68		0.53
Uniform Delay, d1	19.5			19.6	7.4	9.1	10.6		28.6
Progression Factor	1.00			1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	16.5			21.2	0.1	0.6	3.2		26.7
Delay (s)	36.0			40.7	7.5	9.7	13.8		55.3
Level of Service	D			D	A	A	B		E
Approach Delay (s)	36.0			40.7			12.2		
Approach LOS	D			D			B		

Intersection Summary			
HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	11.2
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	WBL	WBT	NBR	SBL	SBT	SBR	SER
Lane Configurations								
Volume (vph)	372	42	237	134	255	164	215	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.6		3.6	3.6	3.6	3.6		4.0
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00		1.00
Frpb, ped/bikes	1.00		1.00	0.79	1.00	0.70		1.00
Flpb, ped/bikes	1.00		0.97	1.00	0.66	1.00		1.00
Frt	1.00		1.00	0.86	1.00	0.91		0.86
Flt Protected	1.00		0.99	1.00	0.95	1.00		1.00
Satd. Flow (prot)	1863		1793	1277	1161	1184		1611
Flt Permitted	1.00		0.70	1.00	0.95	1.00		1.00
Satd. Flow (perm)	1863		1259	1277	1161	1184		1611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	404	46	258	146	277	178	234	9
RTOR Reduction (vph)	0	0	0	71	0	0	0	0
Lane Group Flow (vph)	404	0	304	75	277	412	0	9
Confl. Peds. (#/hr)		300		340	340		250	
Turn Type		Perm		custom	Perm			custom
Protected Phases	2		2			8		1
Permitted Phases		2		4	8			1
Actuated Green, G (s)	16.6		16.6	29.7	29.7	29.7		0.6
Effective Green, g (s)	16.6		16.6	29.7	29.7	29.7		0.6
Actuated g/C Ratio	0.29		0.29	0.51	0.51	0.51		0.01
Clearance Time (s)	3.6		3.6	3.6	3.6	3.6		4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0		3.0
Lane Grp Cap (vph)	532		360	653	593	605		17
v/s Ratio Prot	0.22					c0.35		c0.01
v/s Ratio Perm			c0.24	0.06	0.24			
v/c Ratio	0.76		0.84	0.11	0.47	0.68		0.53
Uniform Delay, d1	18.9		19.5	7.4	9.1	10.6		28.6
Progression Factor	1.00		1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	9.8		20.9	0.1	0.6	3.2		26.7
Delay (s)	28.7		40.4	7.5	9.7	13.8		55.3
Level of Service	C		D	A	A	B		E
Approach Delay (s)	28.7		40.4			12.2		
Approach LOS	C		D			B		

Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	58.1	Sum of lost time (s)	11.2
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	98	427	7	100	10	0	0	25	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					3.5			3.5			3.5	
Lane Util. Factor					1.00			1.00			1.00	
Frpb, ped/bikes					0.99			1.00			0.96	
Flpb, ped/bikes					0.85			0.84			1.00	
Frt					1.00			1.00			0.97	
Flt Protected					0.99			0.96			1.00	
Satd. Flow (prot)					1553			1492			1735	
Flt Permitted					0.99			0.72			1.00	
Satd. Flow (perm)					1553			1125			1735	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	107	464	8	109	11	0	0	27	7
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	578	0	0	120	0	0	28	0
Confl. Peds. (#/hr)				870		570	80					80
Turn Type				Perm			Perm					
Protected Phases					8			2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					21.5			12.5			12.5	
Effective Green, g (s)					21.5			12.5			12.5	
Actuated g/C Ratio					0.29			0.17			0.17	
Clearance Time (s)					3.5			3.5			3.5	
Lane Grp Cap (vph)					445			188			289	
v/s Ratio Prot											0.02	
v/s Ratio Perm					0.37			c0.11				
v/c Ratio					1.30			0.64			0.10	
Uniform Delay, d1					26.8			29.1			26.5	
Progression Factor					1.09			1.20			1.00	
Incremental Delay, d2					147.0			11.0			0.7	
Delay (s)					176.3			46.0			27.1	
Level of Service					F			D			C	
Approach Delay (s)		0.0			176.3			46.0			27.1	
Approach LOS		A			F			D			C	

Intersection Summary			
HCM Average Control Delay	148.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	41.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	98	427	7	100	10	0	0	25	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					3.5			3.5			3.5	
Lane Util. Factor					1.00			1.00			1.00	
Frpb, ped/bikes					0.99			1.00			0.96	
Flpb, ped/bikes					0.85			0.84			1.00	
Frt					1.00			1.00			0.97	
Flt Protected					0.99			0.96			1.00	
Satd. Flow (prot)					1553			1492			1735	
Flt Permitted					0.99			0.72			1.00	
Satd. Flow (perm)					1553			1125			1735	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	107	464	8	109	11	0	0	27	7
RTOR Reduction (vph)	0	0	0	0	1	0	0	0	0	0	6	0
Lane Group Flow (vph)	0	0	0	0	578	0	0	120	0	0	28	0
Confl. Peds. (#/hr)				870		570	80					80
Turn Type				Perm			Perm					
Protected Phases					8			2			6	
Permitted Phases				8			2					
Actuated Green, G (s)					21.5			12.5			12.5	
Effective Green, g (s)					21.5			12.5			12.5	
Actuated g/C Ratio					0.29			0.17			0.17	
Clearance Time (s)					3.5			3.5			3.5	
Lane Grp Cap (vph)					445			188			289	
v/s Ratio Prot											0.02	
v/s Ratio Perm					0.37			c0.11				
v/c Ratio					1.30			0.64			0.10	
Uniform Delay, d1					26.8			29.1			26.5	
Progression Factor					1.00			1.14			1.00	
Incremental Delay, d2					148.7			9.8			0.7	
Delay (s)					175.3			42.9			27.1	
Level of Service					F			D			C	
Approach Delay (s)		0.0			175.3			42.9			27.1	
Approach LOS		A			F			D			C	

Intersection Summary			
HCM Average Control Delay	146.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.06		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	41.0
Intersection Capacity Utilization	48.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	377	45	88	244	58	15	83	118	69	46	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0			4.0			4.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frpb, ped/bikes		0.99			0.97			0.80			0.97	
Flpb, ped/bikes		0.98			0.99			0.99			0.90	
Frt		0.99			0.98			0.93			0.99	
Flt Protected		0.99			0.99			1.00			0.97	
Satd. Flow (prot)		1757			1727			1360			1574	
Flt Permitted		0.82			0.79			0.98			0.56	
Satd. Flow (perm)		1453			1388			1332			901	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	137	410	49	96	265	63	16	90	128	75	50	13
RTOR Reduction (vph)	0	4	0	0	8	0	0	58	0	0	5	0
Lane Group Flow (vph)	0	592	0	0	416	0	0	176	0	0	133	0
Confl. Peds. (#/hr)	210		150	150		210	110		140	140		110
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		40.0			40.0			15.0			15.0	
Effective Green, g (s)		40.0			40.0			15.0			15.0	
Actuated g/C Ratio		0.53			0.53			0.20			0.20	
Clearance Time (s)		4.0			4.0			4.0			4.0	
Lane Grp Cap (vph)		775			740			266			180	
v/s Ratio Prot												
v/s Ratio Perm		c0.41			0.30			0.13			c0.15	
v/c Ratio		0.76			0.56			0.66			0.74	
Uniform Delay, d1		13.8			11.7			27.7			28.2	
Progression Factor		1.00			0.87			1.00			1.39	
Incremental Delay, d2		7.0			2.7			12.3			2.5	
Delay (s)		20.8			12.8			40.0			41.7	
Level of Service		C			B			D			D	
Approach Delay (s)		20.8			12.8			40.0			41.7	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	126	377	45	88	244	58	15	83	118	69	46	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	0.96		1.00	0.90			0.89			0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			0.99			0.94	
Frt	1.00	0.98		1.00	0.97			0.93			0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.97	
Satd. Flow (prot)	1770	1762		1770	1635			1508			1648	
Flt Permitted	0.95	1.00		0.95	1.00			0.98			0.56	
Satd. Flow (perm)	1770	1762		1770	1635			1476			943	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	137	410	49	96	265	63	16	90	128	75	50	13
RTOR Reduction (vph)	0	6	0	0	11	0	0	58	0	0	5	0
Lane Group Flow (vph)	137	453	0	96	317	0	0	176	0	0	133	0
Confl. Peds. (#/hr)	210		150	150		210	110		140	140		110
Turn Type	Prot			Prot			Perm			Perm		
Protected Phases	7	4		3	8			2			6	
Permitted Phases							2			6		
Actuated Green, G (s)	6.0	30.0		6.0	30.0			15.0			15.0	
Effective Green, g (s)	6.0	30.0		6.0	30.0			15.0			15.0	
Actuated g/C Ratio	0.08	0.40		0.08	0.40			0.20			0.20	
Clearance Time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Grp Cap (vph)	142	705		142	654			295			189	
v/s Ratio Prot	c0.08	c0.26		0.05	0.19							
v/s Ratio Perm								0.12			c0.14	
v/c Ratio	0.96	0.64		0.68	0.48			0.60			0.70	
Uniform Delay, d1	34.4	18.2		33.6	16.7			27.3			27.9	
Progression Factor	1.00	1.00		0.78	1.26			1.00			1.16	
Incremental Delay, d2	66.7	4.5		20.2	2.2			8.7			2.0	
Delay (s)	101.1	22.6		46.5	23.3			35.9			34.5	
Level of Service	F	C		D	C			D			C	
Approach Delay (s)		40.7			28.6			35.9			34.5	
Approach LOS		D			C			D			C	

Intersection Summary			
HCM Average Control Delay	35.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	212	78	167	291	66	169
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	230	85	182	316	72	184

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	315	498	255
Volume Left (vph)	0	182	72
Volume Right (vph)	85	0	184
Hadj (s)	-0.13	0.11	-0.34
Departure Headway (s)	5.3	5.2	5.6
Degree Utilization, x	0.46	0.73	0.40
Capacity (veh/h)	649	670	582
Control Delay (s)	12.7	20.8	12.3
Approach Delay (s)	12.7	20.8	12.3
Approach LOS	B	C	B

Intersection Summary			
Delay	16.4		
HCM Level of Service	C		
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	212	78	167	291	66	169
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	230	85	182	316	72	184

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total (vph)	315	182	316	255
Volume Left (vph)	0	182	0	72
Volume Right (vph)	85	0	0	184
Hadj (s)	-0.13	0.53	0.03	-0.34
Departure Headway (s)	5.3	6.2	5.7	5.5
Degree Utilization, x	0.46	0.31	0.50	0.39
Capacity (veh/h)	651	564	617	604
Control Delay (s)	12.7	10.8	13.0	11.9
Approach Delay (s)	12.7	12.2		11.9
Approach LOS	B	B		B

Intersection Summary			
Delay	12.3		
HCM Level of Service	B		
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	48	37	306	46	41	252
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.95			1.00	0.90	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	0.88	
Flt Protected	1.00			0.96	0.99	
Satd. Flow (prot)	1668			1785	1478	
Flt Permitted	1.00			0.96	0.99	
Satd. Flow (perm)	1668			1785	1478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	40	333	50	45	274
RTOR Reduction (vph)	34	0	0	0	234	0
Lane Group Flow (vph)	58	0	0	383	85	0
Confl. Peds. (#/hr)		80	80		20	50
Turn Type			Split			
Protected Phases	4		8	8	2	
Permitted Phases						
Actuated Green, G (s)	11.0			27.0	11.0	
Effective Green, g (s)	11.0			27.0	11.0	
Actuated g/C Ratio	0.15			0.36	0.15	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	245			643	217	
v/s Ratio Prot	c0.03			c0.21	c0.06	
v/s Ratio Perm						
v/c Ratio	0.24			0.60	0.39	
Uniform Delay, d1	28.3			19.6	29.0	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	2.3			4.0	5.3	
Delay (s)	30.5			23.6	34.2	
Level of Service	C			C	C	
Approach Delay (s)	30.5			23.6	34.2	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	48	37	306	46	41	252
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.0	
Lane Util. Factor	1.00			1.00	1.00	
Frpb, ped/bikes	0.95			1.00	0.90	
Flpb, ped/bikes	1.00			1.00	1.00	
Frt	0.94			1.00	0.88	
Flt Protected	1.00			0.96	0.99	
Satd. Flow (prot)	1668			1785	1478	
Flt Permitted	1.00			0.96	0.99	
Satd. Flow (perm)	1668			1785	1478	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	40	333	50	45	274
RTOR Reduction (vph)	34	0	0	0	234	0
Lane Group Flow (vph)	58	0	0	383	85	0
Confl. Peds. (#/hr)		80	80		20	50
Turn Type			Split			
Protected Phases	4		8	8	2	
Permitted Phases						
Actuated Green, G (s)	11.0			27.0	11.0	
Effective Green, g (s)	11.0			27.0	11.0	
Actuated g/C Ratio	0.15			0.36	0.15	
Clearance Time (s)	4.0			4.0	4.0	
Lane Grp Cap (vph)	245			643	217	
v/s Ratio Prot	c0.03			c0.21	c0.06	
v/s Ratio Perm						
v/c Ratio	0.24			0.60	0.39	
Uniform Delay, d1	28.3			19.6	29.0	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	2.3			4.0	5.3	
Delay (s)	30.5			23.6	34.2	
Level of Service	C			C	C	
Approach Delay (s)	30.5			23.6	34.2	
Approach LOS	C			C	C	

Intersection Summary			
HCM Average Control Delay	28.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	75.0	Sum of lost time (s)	26.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	472	219	46	213	66	76
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	513	238	50	232	72	83

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	513	238	282	154
Volume Left (vph)	0	0	50	72
Volume Right (vph)	0	238	0	83
Hadj (s)	0.03	-0.67	0.07	-0.19
Departure Headway (s)	5.3	4.6	5.3	5.8
Degree Utilization, x	0.76	0.30	0.42	0.25
Capacity (veh/h)	663	767	654	571
Control Delay (s)	21.7	8.4	12.0	10.7
Approach Delay (s)	17.5		12.0	10.7
Approach LOS	C		B	B

Intersection Summary			
Delay	15.3		
HCM Level of Service	C		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Volume (vph)	472	283	46	213	66	76
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	513	308	50	232	72	83

Direction, Lane #	EB 1	EB 2	WB 1	NW 1
Volume Total (vph)	513	308	282	154
Volume Left (vph)	0	0	50	72
Volume Right (vph)	0	308	0	83
Hadj (s)	0.03	-0.67	0.07	-0.19
Departure Headway (s)	5.3	4.6	5.3	5.9
Degree Utilization, x	0.76	0.39	0.42	0.25
Capacity (veh/h)	662	768	652	571
Control Delay (s)	21.8	9.4	12.1	10.8
Approach Delay (s)	17.1		12.1	10.8
Approach LOS	C		B	B

Intersection Summary			
Delay	15.2		
HCM Level of Service	C		
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX C

Cultural Resources

Appendix C includes correspondence to date for Section 106 consultation requirements.

Preserving America's Heritage

November 2, 2007

Brian O'Neill, General Superintendent, Golden Gate National Recreation Area
Kate Richardson, Superintendent, San Francisco Maritime National Historical Park
National Park Service
Golden Gate National Recreation Area
Fort Mason, San Francisco, CA 94123

RE: *Proposed Extension of the San Francisco Municipal Railway Historic Streetcar Line*
San Francisco, California

Dear Mr. O'Neill and Ms. Richardson:

On October 16, 2007, the Advisory Council on Historic Preservation (ACHP) received your notification for the proposed area of potential effect (APE) and scope of identification efforts for historic properties that may be affected by the referenced undertaking pursuant to our regulations, "Protection of Historic Properties" (36 CFR Part 800).

Thank you for providing us with this information regarding the National Park Service's progress in its Section 106 consultation. We encourage the NPS to continue consultation with the California State Historic Preservation Office, Indian tribes, and other consulting parties to identify and evaluate historic properties and to assess any potential adverse effects on those historic properties. If you determine, through consultation with the consulting parties, that the undertaking will adversely affect historic properties, or that the development of a Programmatic Agreement is necessary, the NPS must notify the ACHP and provide the documentation detailed at 36 CFR § 800.11(e).

Should you have any questions as to how your agency should comply with the requirements of Section 106, please contact me by telephone at (202) 606-8583 or by e-mail at kfanizzo@achp.gov.

Sincerely,

Kelly Yasaitis Fanizzo
Historic Preservation Specialist
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION
1100 Pennsylvania Avenue NW, Suite 809 • Washington, DC 20004
Phone: 202-606-8503 • Fax: 202-606-8647 • achp@achp.gov • www.achp.gov

STATE OF CALIFORNIA – THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, *Governor*

OFFICE OF HISTORIC PRESERVATION
DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
SACRAMENTO, CA 94296-0001
(916) 653-6624 Fax: (916) 653-9824
calshpo@ohp.parks.ca.gov
www.ohp.parks.ca.gov

3 December 2007

Reply To: NPS071019A

Kate Richardson, Superintendent
National Park Service
San Francisco Maritime National Historical Park
Building E, Lower Fort Mason, Room 265
San Francisco, CA 94123

Brian O'Neill, General Superintendent
National Park Service
Golden Gate National Recreation Area
Fort Mason
San Francisco, CA 94123

Re: Section 106 Review for the San Francisco Municipal Railway (Muni) Extension, San Francisco, San Francisco County, CA

Dear Ms. Richardson and Mr. Neill:

Thank you for your letter of 4 October 2007, requesting my comment pursuant to the National Historic Preservation Act and the implementing regulations codified at 36 CFR 800 with regards to the above undertaking. You are requesting that I concur with your determination of the APE for the undertaking and comment on the general project approach.

As I presently understand it, the undertaking consists of extension of the San Francisco Municipal Railway (Muni) historic streetcar line.

The APE for the project is shown in Figure 1 attached to your letter. This APE includes the areas that could be impacted by all of the proposed alignments and turnaround options. The proposed APE consists of the properties fronting on streets or areas where new track would be constructed, as well as the full extent of eight previously designated historic resources surrounding or abutting the project area. I find this satisfactory pursuant to 36 CFR 800.16(d).

At the time of your letter, eight properties were listed in the National Register of Historic Places (NRHP) of which three are National Historic Landmarks. There are approximately eighteen more properties which will be evaluated for inclusion in the NRHP.

At this time I feel the NPS project scope is adequate and I look forward to continuing this consultation as the NPS moves forward with the project.

Thank you for considering historic properties as part of you project planning. If you have any questions, please contact Amanda Blosser of my staff at (916) 653-9010 or e-mail at ablosser@parks.ca.gov

Sincerely,

Susan K Stratton for

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer

MWD:ab

Figure 1. Area of Potential Effect

APE Boundaries
Parcels Requiring Survey
Identified Historic Properties

PAGE & TURNBULL
724 PINE STREET, SAN FRANCISCO, CALIFORNIA 94108 TEL 415.362.5154 FAX 415.362.5560
2401 C ST., STE. B, SACRAMENTO, CALIFORNIA 95816 TEL 916.930.9903 FAX 916.930.9904
417 S. HILL ST., STE. 203, LOS ANGELES, CALIFORNIA 90013 TEL 213.221.1200 FAX 213.221.1209
page-turnbull.com

United States Department of the Interior
NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason # 201
San Francisco, California 94123

IN REPLY REFER TO:

H4217 (GOGA-CRMM)

September 29, 2009

Milford Wayne Donaldson, FAIA
State Historic Preservation Officer
Attn: Mark Beason
Department of Parks and Recreation
Office of Historic Preservation
1416 9th Street
Sacramento, CA 95814

Dear Mr. Donaldson:

We wish to thank Steve Mikesell, Susan Stratton, and Mark Beason of your staff for making a site visit to San Francisco on January 28, 2009, for the purpose of holding a National Historic Preservation Act Section 106 consultation meeting concerning an undertaking to extend the San Francisco Municipal Railway historic streetcar line from Fishermen's Wharf, through the historic Ft. Mason tunnel, to the Marina district within the city of San Francisco. Section 106 consultation was initiated for this undertaking via letter from Golden Gate National Recreation Area and San Francisco Maritime National Historical Park dated May 2, 2006 (NPS071019A). Though we have not yet reached the point in planning where we are prepared to assess effects of the undertaking on historic properties, please be informed that in conformance with 36 CFR 800.8 of the Section 106 regulations, "Coordination with the National Environmental Policy Act," findings of effect for this undertaking will be documented in a draft Environmental Impact Statement that will be shared with your office for comment at a later date.

As a means of furthering the Section 106 consultation at this time, the National Park Service, through the agencies of URS Corporation and Page & Turnbull, has prepared the enclosed historic structures and archeological reports in order to identify historic properties that may be affected by the proposed extension of the historic streetcar line within the Area of Potential Effect (APE) previously established for the undertaking in consultation with your office. URS and Page & Turnbull briefed SHPO staff on these reports at the January 2009 meeting.

To identify historic properties, Page & Turnbull completed State of California Department of Parks and Recreation (DPR) 523A (Primary Record) and 523B (Building, Structure, Object Record) forms for all properties older than forty-five years old located within the previously identified APE. Within the APE boundaries, eight properties were already listed in the National Register of Historic Places (National

Register), and thirty-seven properties were evaluated for historic significance utilizing the criteria set forth by the National Register. None of the thirty-seven properties were found eligible for the National Register, although four were found to be eligible for the California Register of Historical Resources (California Register).

Archaeological properties within the APE were identified by review of existing records, supplemental contextual research, and pedestrian survey (URS 2009). The North West Information Center of the California Historical Resources Information System provided information on 18 archaeological sites within .25 miles of the project area. Two of the sites were within the APE, CA-SFR-23 and CA-SFR-29, and may be affected by project actions if they still exist. Neither the pedestrian survey nor the supplemental historical research located any unrecorded archaeological properties or suggestion of buried properties in the APE.

This effort to identify historic properties was completed according to the provisions of Section 106 at 36 CFR 800.4, "Identification of historic properties." As a means of documenting our conformance with this provision of Section 106, we request that you review the enclosed reports and inform us of their adequacy. Any comments or questions on this matter may be directed to Paul Scolari, Historian, Golden Gate NRA, at (415) 561-4963 and Robbyn Jackson, Chief of Cultural Resources, San Francisco Maritime NHP, at (415) 561-7019.

Sincerely,

Frank Dean
Acting Superintendent
Golden Gate NRA

Kate Richardson
Superintendent
San Francisco Maritime NHP

Enclosures

cc:
Advisory Council on Historic Preservation, w/o enc.
Elaine Jackson-Retondo, NPS NHL Coordinator, Pacific West Region, w/o enc.

United States Department of the Interior

NATIONAL PARK SERVICE
GOLDEN GATE NATIONAL RECREATION AREA www.nps.gov/goga
FORT MASON BLDG. 201 SAN FRANCISCO, CA 94123-0022

N1621

JUN 15 2010

Dear Ohlone/Costanoan Representative:

The purpose of this letter is to invite you to participate in consultation in accordance with the National Historic Preservation Act of 1966, as amended (NHPA), regarding the proposed "Extension of Historic Streetcar Service from Fisherman's Wharf to the San Francisco Maritime National Historical Park and Golden Gate National Recreation Area's Fort Mason Center." The National Park Service (NPS) will prepare an Environmental Impact Statement (EIS) to examine the environmental impacts of extending the streetcar service west to Fort Mason.

The proposed project is needed to improve local and regional accessibility to these two units of the NPS by means of a zero-local-emission transit connection compatible with the historic nature of the parks. Conditions prompting the need for this project include: inadequate regional transit access, inefficient access for low-income populations, limited connectivity to the northeastern waterfront cultural corridor, and insufficient transportation infrastructure to accommodate existing and projected visitor demands at the parks.

The Historic Streetcar Extension project involves extending the existing Muni historic streetcar line from the intersection of Jefferson and Jones streets to the west side of Fort Mason, to serve several NPS properties and improve local transit connectivity. The project will be situated on, and will affect properties of the City of San Francisco and of the U.S. government. The project as defined includes several alternative configurations of new tracks on Jefferson and Beach streets, beginning at Jones Street and extending west to Van Ness Avenue. All alternatives include construction of new track through a portion of Aquatic Park, a National Historical Landmark (NHLD), and use of an existing tunnel under Fort Mason to extend the line from Van Ness Avenue to a western terminus at Laguna Street.

Alternative Fort Mason Terminal Configurations

NPS is considering two general alternatives for the western terminus of the street car line at Fort Mason. The first type directly serves Fort Mason Center within the existing parking area of the San Francisco Port of Embarkation NHLD. The second type terminates the line within the Great Meadow of Fort Mason, on NPS property but outside the NHLD. Un-scaled concept drawings of these general alternatives are enclosed.

Area of Potential Effect (APE)

The APE for the Historic Streetcar Extension project is shown in Figure 1 (Enclosed). This APE includes the areas that could be affected by all of the proposed alignments and turnaround options. The proposed APE consists of the properties fronting on streets or areas where new track would be constructed, as well as the full extent of several previously designated historic resources surrounding or abutting the project area. Previously designated historic resources within the APE include:

Property Name	Address/Location	Status
CA-SFr-29	Fort Mason	National Register Eligible
CA-SFr-23	Hyde and Beach Street	Not Determined

San Francisco Cable Cars	Hyde and Beach Street	National Historic Landmark
Haslett Warehouse	680 Beach Street	National Register Listed
Aquatic Park Historic District	Beach Street (vicinity)	National Historic Landmark
SF Water Dept. Auxiliary Water Supply System; Pumping Station # 2	Foot of Van Ness Ave.	National Register Listed
San Francisco Port of Embarkation, U.S. Army	Fort Mason	National Historic Landmark
Fort Mason Historic District	Fort Mason	National Register Listed
Pioneer Woolen Mills D. Ghirardelli Company	900 North Point Street	National Register Listed
Unknown-storage	2907 Jones Street	California Register of Historical Resources Eligible
Unknown-storage	2911 Jones Street	California Register of Historical Resources Eligible
The Cannery	2801 Leavenworth Street	California Register of Historical Resources Eligible
Marina Safeway	11-15 Marina Boulevard	California Register of Historical Resources Eligible

Need to Determine Location and Extent of Historic Properties

Two known indigenous archeological sites, one in the city of San Francisco and one in Ft. Mason, are within the planning area and in the vicinity of where the rail line may run (See enclosed Figure 1). This information was previously provided to you in Golden Gate National Recreation Area's "Native Update" (June 2009 and March 2010). An archeological investigation aimed at identifying the boundaries of these sites in order to inform future planning and design is warranted, and will be carried out in the near future. A Scope-of-Work for limited archeological testing has been prepared (Enclosed). The NPS will arrange for a native monitor to be present during all subsurface testing activities described in the Scope-of-Work. CA-SFr-29, a pre-contact habitation site, was originally located in 1978 during systematic subsurface augering, conducted by Suzanne Baker. In June of 1979, test excavations were conducted at CA-SFr-29. It was determined that the site contained significant undisturbed deposits of cultural material including bone, stone, shell artifacts and faunal residues. The site was considered eligible for listing on the National Register of Historic Places, and recommendations were made to protect the site during re-landscaping of Fort Mason by placing fill over existing concrete and asphalt that capped the site at that time. Because much of the site has been covered by historical and modern construction, its exact boundaries are unknown. Limited archaeological testing is proposed to determine the extant site boundaries in relationship to the current south loop terminus option.

CA-SFr-23, a pre-contact shell midden site is purportedly located near the intersection of Hyde and Beach Streets and was last recorded in 1954. According to the site survey record, the site information is taken from an 1861 publication titled "The Indianology of California" (Davis, 1954). The site was described as a "circular fire-burnt spot on the bare place at the summit of a sandy cliff, 40' high, with quantities of decayed fish-bone and crushed shells mixed with sand." In addition, the 1954 site record also states that the site was destroyed in 1861. It is unclear whether the recorder was able to, or attempted to, relocate the site in 1954. Although no evidence of the site is currently visible, it is possible that subsurface cultural material is present. The enclosed Archeological Testing Scope-of-Work proposes that an archeological consultant provide an overview of all previous archeological site descriptions and reported location of the site and develop recommendations on possible testing to relocate the site and or/monitoring as appropriate.

We would greatly appreciate your comments on the proposed project, including the enclosed Scope-of-Work. Comments will be compiled and considered for integration into the EIS as appropriate. A copy of

the EIS will be provided when drafted for additional review and comments. We currently expect to have a draft of the EIS available for your review early in 2011.

Should you have questions or comments concerning the proposed undertaking, or on the enclosed Scope-of-Work, please contact Paul Scolari, Historian and American Indian Liaison, at (415) 561-4963 or paul_scolari@nps.gov, by July 15, 2010. We will share the results of the archeological investigation with you once field work has been completed and reported on. We look forward to working with you on this important transportation project.

Sincerely,

for

Acting General Superintendent
Golden Gate National Recreation Area

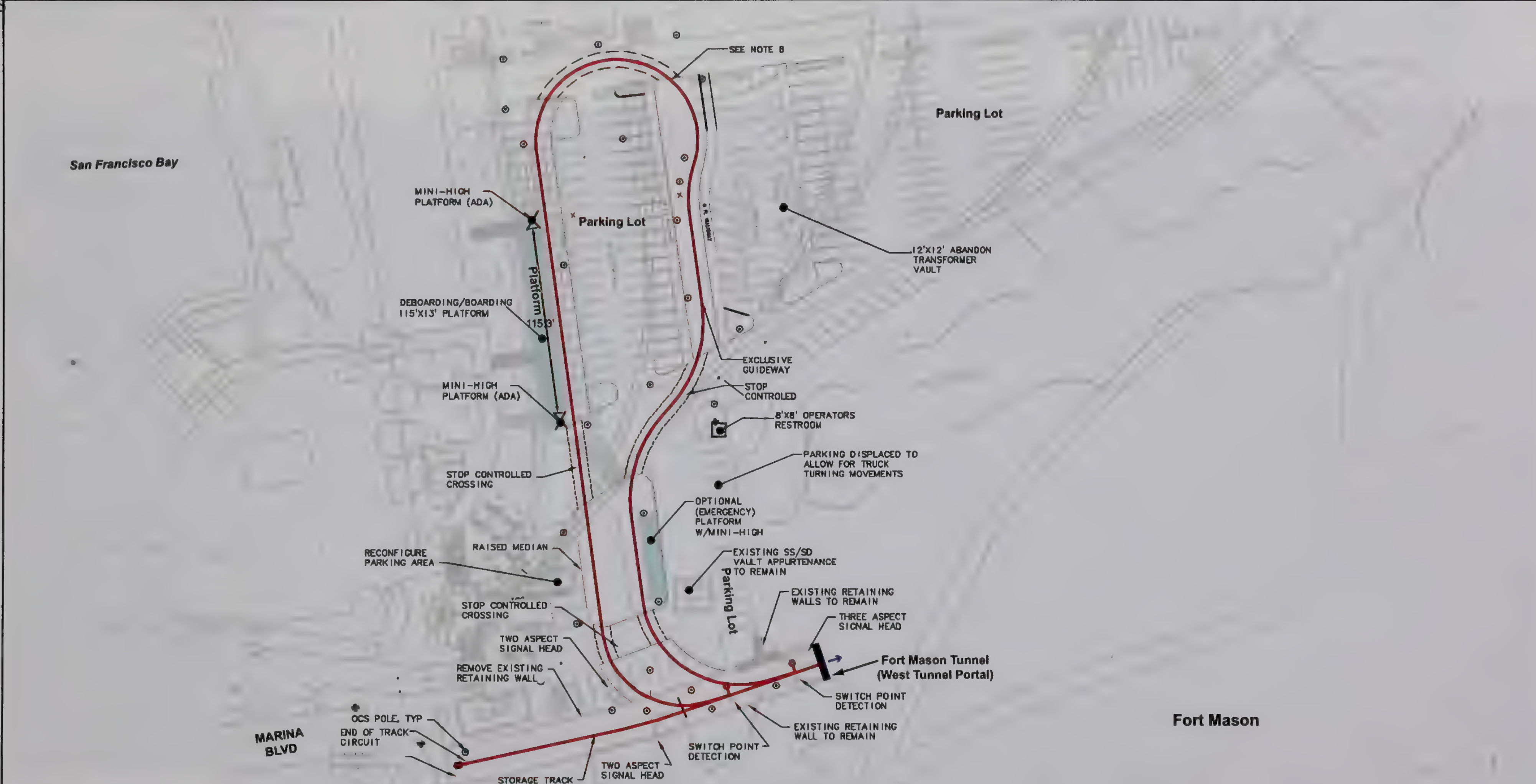
Superintendent
San Francisco Maritime National Historical Park

Enclosures

cc:
California State Historic Preservation Office, w/o Enc.
Advisory Council on Historic Preservation, w/o Enc.
National Historic Landmarks Coordinator, NPS-Pacific West Region, w/o Enc.

Figure 1. Area of Potential Effect

APE Boundaries
Parcels Requiring Survey
Identified Historic Properties



LEGEND

- Proposed Streetcar Alignment
- Proposed Retaining Wall
- Turnout
- Approximate OCS Pole Location
- Shared with Autos
- Station Platform

Notes:

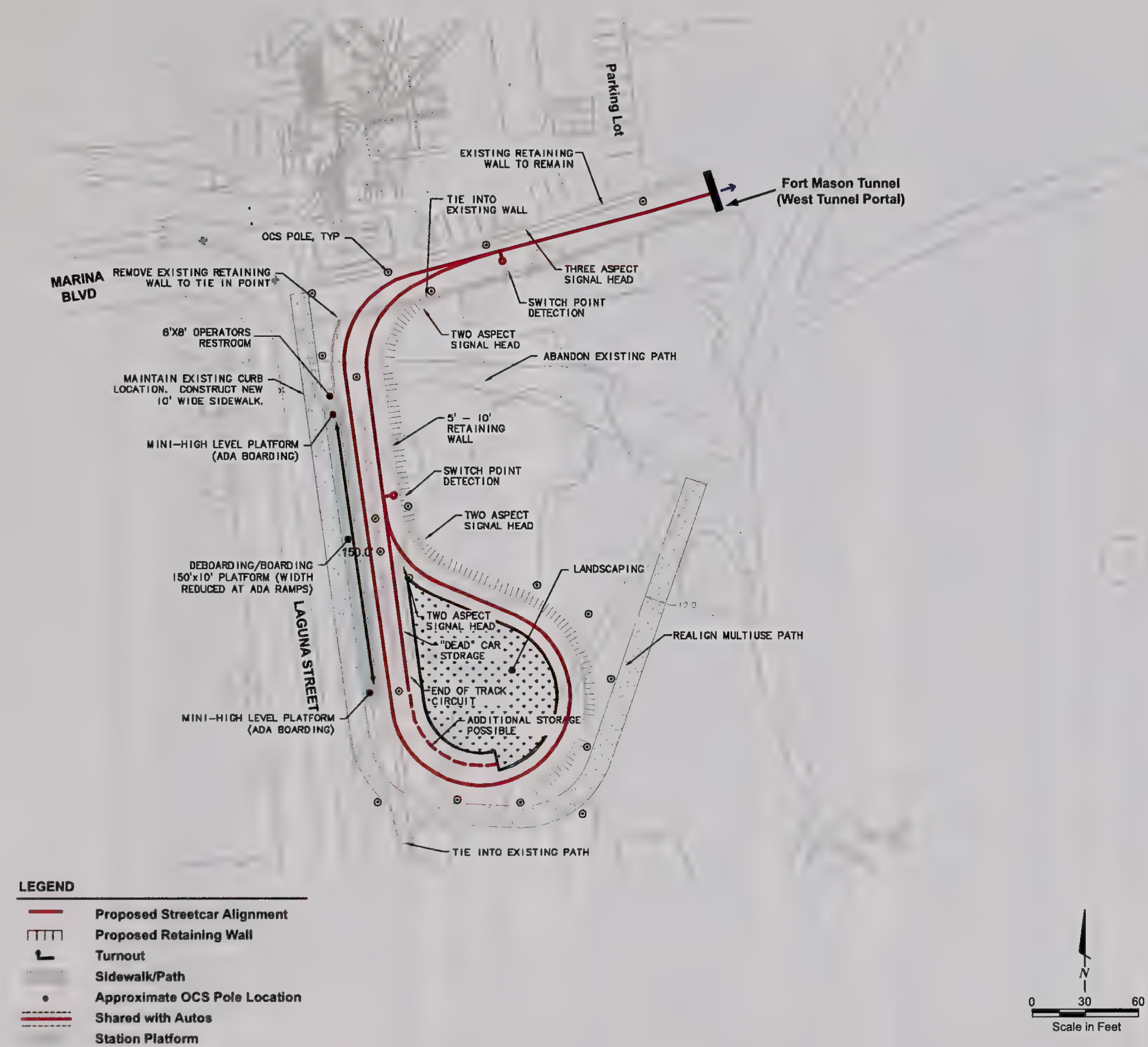
1. Minimum radius used = 50'
2. Assume "TEE" rail is used through tunnel & girder rail through special trackwork and parking lot.
3. Existing north retaining wall removed.
4. Streetcar encroaches on single track segment in order to enter storage track.
5. OCS poles shown approximate and for illustrative purposes only.
6. Reducing radius to 45ft may allow for additional parking. Parking configuration should be evaluated and optimized during preliminary engineering.
7. All trackway in exclusive R/W unless otherwise shown

FORT MASON TURNAROUND
2 OF 5 - LOOP NORTH (A.2)

February 2009 — Transit Operations Plan
28067144 — Historic Streetcar Extension
San Francisco, California

FIGURE 2

2/9/09 hk ..T:\28067144 Historic Streetcar EIS\Transit Op Plan Feb09\F2_turn_2.ai



Notes:
1. Minimum radius used = 50'
2. Assume "TEE" rail is used through tunnel & loop. This will deter pedestrians from fouling the track.
3. Retaining walls could be reduced and/or eliminated by regarding. Additional path relocation would be required.
4. Existing retaining wall and parking to the north is not impacted.
5. 3 car platform capacity
6. "Dead Car" storage provided
7. OCS poles shown approximate and for illustrative purposes only.
8. All trackway in exclusive R/W

FORT MASON TURNAROUND
4 OF 5 - SOUTH LOOP (A.4)

February 2009
28067144

Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 4

2/9/09 hk T:\28067144 Historic Streetcar EIS\Transit Op Plan Feb09\F4_turn_4.ai

Government Scope and Estimate
Project: F-Line Historic Streetcar
Task: Assessment of South Loop Alternative Effects on CA-SFR-29 and Review of CA-SFr-23 Treatment

The National Park Service is seeking a subsurface archaeological survey of the boundaries of prehistoric site CA-SFR-29 at Fort Mason, San Francisco to determine potential effects on the property that would result from implementation of the "South Loop" alternative for the F-Line Historic Streetcar Project (see attached project and site maps). A review of archaeological data and San Francisco Planning Department records will also be conducted on CA-SFr-23, reported near the intersection of Hyde and Beach Street. A detailed report of CA-SFr-29 investigations with GPS coordinate data and mapping of site and associated features (capping fills or concrete foundations) will be prepared. Previous efforts to consider CA-SFr-23 in planning will be reviewed, and practical alternatives will be proposed for a subsurface survey of the CA-SFr-23 locale, or for monitoring with discovery protocols during construction.

Subsurface archaeological explorations were conducted by hand and power augers in 1978 in preparation for landscaping resulting in what is today referred to as the Great Meadow on the western side of the historic post (Baker 1978a,b). Work located and tested prehistoric site CA-SFR- 29, much of which resided beneath the foundation of Building S-130 and an adjacent community garden. Recommendations were made to preserve the site intact by leaving much of the foundation intact above it and placing fill over the community garden areas (Baker 1978b:139).

CA-SFr-23, a prehistoric shell midden site is purportedly located near the intersection of Hyde and Beach Streets and was last recorded in 1954. According to the site survey record, site information is taken from an 1861 publication titled "The Indianology of California". The site was described as a "circular fire-burnt spot on the bare place at the summit of a sandy cliff 40' high, with quantities of decayed fish-bone and crushed shells mixed with sand." In addition, the 1954 site record also states that the site was destroyed in 1861. It is unclear whether the recorder was able to, or attempted to, relocate the site in 1954. Although no evidence of the site is currently visible it is possible that subsurface cultural material is present. We are proposing that an archeological consultant provide an overview of previous archeological site description and composite of location of the site and provide recommendations on possible testing/monitoring as appropriate.

Contractor will be prepared to provide hand and/or power auger, backhoe, jackhammer, or any other method suitable to locate and define the bounds of CA-SFR-29.

Work shall include:

- Work shall focus on subsurface clarification of the southern and northern boundaries of CA-SFR-29 with as minimal intrusion to the midden deposit as possible. The archaeological records and San Francisco Planning Department reviews for the area.
- Based on existing sources and fieldwork, compare and analyze the proposed layout of the South-Loop Alternative of the F-Line Historic Streetcar against the location of CA-SFR-29. Provide a discussion of any expected adverse effects from the South Loop design on this historic property in accordance with 36 CFR 800 and Section 106 of the National Historic Preservation Act.
- Consult with NPS Archaeologist (Leo Barker, 415-561-2836).

- Consult with Randall Dean, Archaeologist, San Francisco Planning Department (415-575-9029) and research City files on CA-SFr-23 and those environmental review projects that have considered this site in planning.
- Contractor will acquire and conduct fieldwork with an Ohlone/Costanoan monitor based on consultation with NPS Tribal Liaison (Paul Scolari, Park Historian, 415-561-4963).
- Consult with NPS regarding known infrastructure in project area (Sondi Matovich, Maintenance Supervisor, 415-289-3101).
- Conduct USA Call (800-227-2600; http://www.usanorth.org/).
- Avoid irrigation system damage, and stockpile turf and topsoil according to protocols established through NPS (Bill Vogele, Maintenance Supervisor, 415-561-4199).
- Consult with NPS regarding upcoming accessible trail work on Great Meadow in CA-SFR-29 vicinity (Rich Meldostad).
- Keep the work zone safely barricaded to keep the public at safe distance.
- GPS the location of all subsurface explorations and produce a map of the site and areas investigated.
- For each excavation, document location and details of soil, stratigraphy, and features uncovered.
- Overall project and particularly heavy equipment use have no adverse impact to discernible archaeological deposits beyond that needed to identify the site.
- Effort to include controlled hand augering of exposed midden deposits to clarify site size and content information.
- Diagnostics materials and artifacts will be collected and used in reporting, including a brief inventory. Materials will be bagged by provenience and submitted to park archaeologist at conclusion of reporting.
- Replace all topsoil and turf per NPS protocols, leaving area as originally found.
- Prepare a revised site form for the California Historical Resources Information System (CHRIS) and the NPS Archaeological Sites Management Information System (ASMIS).
- Provide a detailed report of investigations following at least the outline established in Archaeological Resource Management Reports (ARMR): Recommended Contents and Format, 1990, California Office of Historic Preservation.

Deliverables and Review:

- Provide a digital pdf and Word version of the draft report to the Park Archaeologist and Contract Officer within 30 days of completion of field work;
- Allow NPS 15 days to review and provide comments on the draft report;
- Within 15 days of receipt of draft report comments, prepare final digital pdf and Word version of final report along with ten (10) hardcopies, and provide them to the Park Archaeologist.

<u>References</u>

Baker, Suzanne
1978a Fort Mason Landscaping Project: Preliminary Archaeological Testing, Phase I. Prepared by Archaeological Consultants, Oakland, California. Submitted to Western Region, National Park Service, San Francisco, California. On file at Archaeology Lab, Golden Gate National Recreation Area, San Francisco.

1978b Report on the Fort Mason Archaeological Test Excavations. Prepared by Archaeological Consultants, Oakland, California. Submitted to Western Region, National Park Service, San Francisco, California. On file at Archaeology Lab, Golden Gate National Recreation Area, San Francisco.

Houke, Amy, and Eliot Foulds
2004 Cultural Landscape Report for Fort Baker, Golden Gate National Recreation Area: Volume One: Site History, Existing Conditions, and Analysis. Pacific Northwest Region Office, National Park Service, Seattle. Olmsted Center for Landscape Preservation, Brookline, Massachusetts.

(Budget Estimate is attached as a separate Excel file "F Line Archeo_South Loop Assessment Scope and Budget_LRB_051810.xls) "

Leo R. Barker
Park Archaeologist, Golden Gate National Recreation Area, National Park Service
May 13, 2010

Return Receipt Registered.

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United States Department of the Interior

NATIONAL PARK SERVICE
Golden Gate National Recreation Area
Fort Mason, San Francisco, California 94123

IN REPLY REFER TO:

H4217 (GOGA-CRMM)

DEC 17 2010

Mr. Milford Wayne Donaldson
State Historic Preservation Officer
California Department of Parks and Recreation
Office of Historic Preservation
1725 23rd Street, Suite 100
Sacramento, California 95816

Dear Mr. Donaldson:

We are continuing consultation with you on the proposed Extension of Historic Streetcar Service from Fisherman's Wharf to the Aquatic Park in San Francisco Maritime National Historical Park and the Golden Gate National Recreation Area's Fort Mason Center (undertaking) in San Francisco City and County, California (SHPO project number NPS071019A). In accordance with Section 106 of the National Historic Preservation Act (NHPA), as amended, and implementing guidelines 36 CFR 800.10 (Special Requirements for Protection of National Historic Landmarks) and 36 CFR 800.4 through 36 CFR 800.6, as well as the Secretary of the Interior Standards, we have determined that the proposed undertaking will have adverse effects to historic properties. We are providing documentation for your review and we are requesting your concurrence with our findings.

Project Area of Potential Effects and Previous Consultation

We have previously consulted with your office regarding the Area of Potential Effects (APE) for the proposed undertaking. The boundaries of the APE generally encompass an area from Taylor Street to the east, Laguna Street to the west, the San Francisco Bay to the north, and Bay Street to the south. The APE includes the areas that could be affected by all components of the undertaking. The proposed APE consists of the properties fronting on streets or areas where new track would be constructed, as well as the full extent of several previously designated historic resources surrounding or abutting the project area.

An APE description and delineation map was submitted to your office on August 2, 2007, with the request for concurrence regarding the extent of the APE. We received a concurrence letter from your office on December 3, 2007 pursuant to 36 CFR Part

800.4(a)(1). A copy of the response letter and the APE delineation map are enclosed for your information. As part of the consultation process, we have also provided your office with the results of our efforts to identify historic properties within the APE, sent on September 29, 2009. More information about the historic properties identified is provided below.

Project Location and Description

The proposed undertaking is located along the northern waterfront of the City and County of San Francisco, generally between Fisherman's Wharf to the east and the Fort Mason Center to the west. A project location map is enclosed for your information. The undertaking would allow the San Francisco Municipal Transportation Agency (SFMTA or Muni) to extend streetcar service from its existing terminus at Jones Street in Fisherman's Wharf to the San Francisco Maritime National Historical Park (NHP) and to Golden Gate National Recreation Area (Fort Mason Center), both of which are under the jurisdiction of the National Park Service (NPS).

The undertaking is the culmination of several studies by the NPS, the State of California, the City and County of San Francisco, Muni, and the Presidio Trust. Since the 1970s, a mass-transit connection to the existing local and regional transportation network has been identified as a NPS objective. The congressionally mandated 1977 Golden Gate Travel Study recommended restoring the historic State Belt Railway link from Hyde Street Pier (now part of the San Francisco Maritime NHP) through the State Belt Railway tunnel at Fort Mason to improve access to NPS properties. The historic alignment of the State Belt Railway, in use from 1889–1976, is located within both parks and extends outside of the APE.

The current undertaking is needed to improve local and regional accessibility to these two units of the NPS by means of a zero-local-emission transit connection compatible with the historic nature of the parks. Conditions prompting the need for this project include: inadequate regional transit access, inefficient access for low-income populations, limited connectivity to the northeastern waterfront cultural corridor from the west, and insufficient transportation infrastructure to accommodate existing and projected visitor demands at the parks.

The alignment for the proposed undertaking includes four primary segments. From east to west they are an in-street segment, a transition segment within Aquatic Park, a tunnel improvement segment, and a turnaround segment at the Fort Mason Center. The undertaking also includes an Overhead Contact System (OCS), signal equipment, and signage throughout the length of the alignment. Each of these components is described below in more detail.

The in-street segment would extend two-way streetcar service from the existing F-line Muni terminus at Jefferson and Jones Streets to Leavenworth Street, and then west along Beach Street, either on semi-exclusive tracks or mixed traffic/shared auto arrangements.

The alignment would traverse Aquatic Park between approximately Beach and Polk Streets and approach the Fort Mason tunnel's eastern portal at Van Ness Avenue, in an area known as the transition segment. The transition segment would take the alignment from the street-running segment to the east, shifting the alignment to NPS property to the west of Polk Street. A station would be located on the transition segment near Van Ness Avenue and within NPS property at the far western end of Aquatic Park. In this location, the track would shift from double track to single track between the station platforms and the tunnel portal. The station would have two ADA-compliant platforms, one located on the east side of the transition segment, and one located on the west side (located just south of an existing east/west pedestrian path and the historic speaker tower in Aquatic Park). The station would be constructed in the general location of an existing bocce ball court and historic stone retaining wall.

The Fort Mason Tunnel segment includes improvements to the existing concrete-lined tunnel that runs east-west about 60 feet beneath the upper Fort Mason complex. The tunnel is about 1,500 feet long, 16 feet wide, and 22 feet high at its highest point. Given these limitations, the proposed streetcar extension would run on a single track through the tunnel. The tunnel improvements would include installation of new track and overhead lines and reconstruction of the tunnel interior, including construction of a new tunnel lining. Associated signals, lighting, and utilities would be installed, including traction power feeders.

The turnaround segment would consist of tracks that loop north out of the Fort Mason Tunnel and enter the Fort Mason Center parking lot. A 155-foot-long by 13-foot-wide, ADA-compliant station platform would be located alongside approximately 155 feet of the southernmost end of Building A at Fort Mason Center. A second optional platform could potentially be placed on the loop's eastern side. A segment of the Fort Mason Tunnel's northern retaining wall, up to 50 feet in length, would be removed to provide access from the Fort Mason Tunnel to the parking lot at Fort Mason Center. A storage track would be provided extending west from the loop, adjacent to the Fort Mason gate house. A detection circuit with a "clear to proceed" signal would be installed at the south end of the platform or adjacent to the Fort Mason Tunnel.

The streetcars would be powered by a traction power system which would feed power to the overhead contact system (OCS). The traction power system would connect to an existing substation via underground feeders in duct banks and would provide power to the OCS. The OCS would consist of a single-wire system similar to the existing Muni OCS on the F-Line tracks in the Fisherman's Wharf area. The OCS would be configured for trolley pole operation by historic streetcars. The poles would be spaced every 100 feet on tangent track, and closer together (up to 50 feet apart) where the track curves. Other project components would include standard Muni signal equipment, signage, and lighting.

Native American Consultation

A letter dated June 15, 2010 from the NPS was sent to Ohlone/Costanoan representatives inviting them to participate in consultation regarding the proposed undertaking in accordance with Section 106 of the NHPA. The letter also provided information about and invited consultation on the efforts to identify indigenous archeological sites CA-SFr-23 and CA-SFr-29; additional information about this investigative work is provided below. A copy of the consultation request letter is enclosed for your information. One written response was received on July 15, 2010. Additional comments on the project were received during follow-up phone calls to letter recipients. These collective comments included concerns for protection of Ohlone sites and cultural materials, requests for additional information as it becomes available, offers to monitor future stages of project work if monitoring is required, and suggestions for the development of a treatment plan to address potential encounters with Ohlone cultural resources.

Identification and Evaluation of Historic Properties

The identification and evaluation of cultural resources in the APE was conducted between 2007 and 2010 by Page & Turnbull, URS Corporation, and Holman & Associates. Identification of resources included archival research and intensive-level field surveys. The findings of these efforts are described below.

Identification of historic architectural resources included archival research and field surveys completed by Page & Turnbull from 2007 to 2009. As a result of the archival research, seven properties already listed in the National Register of Historic Places (NRHP, National Register) were identified within the APE (see **Table 1**). These properties are also identified on the attached APE map.

TABLE 1. HISTORIC PROPERTIES LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES

	Name	Location	Listing
1	Aquatic Park National Historic Landmark (NHL) District	Bounded by Van Ness Avenue on the west, Beach Street on the south, and Hyde Street on the east.	National Historic Landmark, National Register-listed
2	San Francisco Port of Embarkation, US Army NHL District	Fort Mason	National Historic Landmark, National Register-listed
3	Fort Mason National Register Historic District	Fort Mason	National Register-listed
4	California Fruit Canners Association (Haslett) Warehouse	680 Beach Street; currently the Argonaut Hotel	National Register-listed

	Name	Location	Listing
5	Pioneer Woolen Mills & D. Ghirardelli Company	900 North Point Street	National Register-listed
6	San Francisco Cable Cars	Hyde and Beach Street	National Historic Landmark, National Register-listed
7	Pumping Station #2, San Francisco Fire Department Auxiliary Water Supply System	Foot of Van Ness Ave.	National Register-listed

The intensive-level survey of the APE completed by Page & Turnbull between 2007 and 2009 also identified a total of 37 buildings and structures outside the park boundaries that were forty-five years old or older. All 37 properties were evaluated for their potential historic significance using the criteria set forth by the National Register. Of these 37 potential resources, none were found eligible for inclusion in the National Register, and four were found to be eligible for the California Register of Historic Resources (the Cannery at 2801 Leavenworth Street, the Marina Safeway at 11-15 Marina Boulevard, and two storage buildings at 2907-2911 Jones Street).

Identification of indigenous archeological resources included archival research and surveys by URS Corporation in 2009 and Holman & Associates (Holman & Associates, 2010). As a result of the archival research, two previously recorded indigenous archeological resources were identified within the areas potentially affected by construction, and are identified below in Table 2, and described below.

TABLE 2. INDIGENOUS ARCHEOLOGICAL PROPERTIES CONSIDERED POTENTIALLY ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES

	Site Number	Location	Listing
1	CA-SFr-29	Fort Mason Great Meadow	Considered National Register Eligible
2	CA-SFr-23	Intersection of Hyde and Beach Street	Considered National Register Eligible if Present

An intensive-level pedestrian survey of the APE was completed by URS Corporation in June, 2009. The field survey yielded no new cultural resource discoveries. In addition, no evidence of CA-SFr-23 or CA-SFr-29 was encountered during that survey.

Site CA-SFr-29, a pre-contact habitation site, was originally located in 1978 during systematic subsurface augering, conducted by Suzanne Baker. In June of 1979, test

excavations were conducted at CA-SFr-29. It was determined that the site contained significant undisturbed deposits of cultural material including bone, stone, shell artifacts and faunal residues. The site was considered eligible for listing on the National Register, and recommendations were made to protect the site during re-landscaping of Fort Mason by placing fill over existing concrete and asphalt that capped the site at that time. Because much of the site has been covered by historical and modern construction, documentation of the exact boundaries of the site in relation to the project APE required clarification.

In July, 2010, Holman & Associates undertook an archeological investigation to identify the location of CA-SFr-29 and determine if the site extended into areas proposed for historic streetcar related improvements. This investigation was conducted under contract to NPS, and in consultation with local Ohlone representatives. Nine auger borings were cored adjacent to Laguna Street and the west entrance to the Fort Mason Tunnel. Mr. Andrew Galvan, an Ohlone representative, monitored the auger borings. No archeological deposits were identified in areas that could be affected by project alternatives.

Site CA-SFr-23, an indigenous shell midden site is purportedly located near the intersection of Hyde and Beach Streets and was last recorded in 1954. According to the site survey record, site information is taken from an 1861 publication titled "The Indianology of California". The site was described as a "circular fire-burnt spot on the bare place at the summit of a sandy cliff 40' high, with quantities of decayed fish-bone and crushed shells mixed with sand." In addition, the 1954 site record also states that the site was destroyed in 1861. It is unclear whether the recorder was able to, or attempted to, relocate the site in 1954. Although no evidence of the site is currently visible it is possible that subsurface cultural material is present.

A letter requesting your concurrence regarding the identification and evaluation of historic properties was sent on September 29, 2009. A copy of the letter is enclosed for your information. As no response has been received to date, it is assumed that your office concurs with the identification and evaluation efforts.

Assessment of Effects

Under Section 106 of the NHPA, an agency shall assess the effects of its activities on historic properties in accordance with 36 CFR 800.5 *Assessment of adverse effects*. The NHPA defines an effect as an alteration to the characteristics of a historic property that qualify it for inclusion in or eligibility for the NRHP. Special requirements are given in 36 CFR 800.10 for protection of National Historic Landmarks (NHLs). In addition to the minimization of harm to the maximum extent possible through project planning and actions by the federal agency, these provisions include participation by the Advisory Council on Historic Preservation (ACHP) in resolution of adverse effects, notification of the Secretary of the Interior of projects that may involve adverse effects to NHLs, and reporting by the ACHP of the outcome of the Section 106 process for any undertakings involving adverse effects to NHLs.

The criteria of adverse effect have been applied to all historic properties within the APE, with consideration given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register.

As you are aware, the criteria of adverse effect are used as a threshold for determining whether the undertaking will have an "adverse effect" or "no adverse effect" on historic properties.

According to 36 CFR 800.5, an adverse effect on a historic property includes, but is not limited to:

I. Physical destruction of or damage to all or part of the property

II. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines

III. Removal of the property from its historic location

IV. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance

V. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

The proposed undertaking will have an adverse effect on two NHL Districts; 1) the Aquatic Park NHL District, and 2) the San Francisco Port of Embarkation, U.S. Army NHL District. Specific effects to each of these NHLs are described below. Effects to the Fort Mason National Register Historic District are included under the same heading as the San Francisco Port of Embarkation, U.S. Army NHL District, because effects would be essentially the same to both the National Register Historic District and the smaller subset of contributing elements that are included in the NHL District. The Fort Mason tunnel is the one exception to this in that it is located outside the NHL District, but inside the National Register Historic District.

<u>Effects to the Aquatic Park NHL District</u>

- Demolition of historic fabric and a contributing resource to the NHL District: removal of a stone retaining wall for tracks and passenger loading platform, and removal of the historic belt line tracks as they cross Van Ness Avenue and approach the tunnel (and beyond) (Criteria of Adverse Effect I: Physical destruction of or damage to all or part of the property). The aspects of integrity that would be adversely affected by this particular action would be integrity of

setting, design, workmanship, and materials. Aspects of integrity that would be unaffected are location, association, and feeling.

- Introduction of features and structures that would be incompatible with the historic uses of the District, such as new tracks, a platform/station, overhead contact system, and signals that were not present in the District during its period of significance. Introduction of new uses to the NHL District that will affect the historic viewshed, such as the alteration of existing views from within the western portion of the District with new views that include: tracks, platform/station, overhead contact system, and signals that do not currently exist (Criteria of Adverse Effect IV: Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance). The aspects of integrity that would be adversely affected by this particular action would be integrity of setting, association, and feeling. Aspects of integrity that would be unaffected are location, design, workmanship, and materials.

- Introduction of new sources of noise, vibration, and light to the NHL District from streetcar operation (Criteria of Adverse Effect V. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features). For example, the Maritime Museum and West Speaker Tower, as well as recreational visitors within the western portion of the District, may experience greater levels of noise, vibration, and light due to streetcar operation than exist currently in this location. These two structures may also experience a temporary increase in noise and vibration due to construction. The aspects of integrity that would be adversely affected by this particular action would be integrity of setting, association, and feeling. Aspects of integrity that would be unaffected are location, design, workmanship, and materials.

In summary, the demolition of historic fabric and a contributing resource to the NHL District, the introduction of incompatible features and structures, the alteration of the historic viewshed, and the introduction of new sources of noise, vibration and light will combine to form an adverse effect to the Aquatic Park NHL District.

<u>Effects to the San Francisco Port of Embarkation, U.S. Army NHL District/Fort Mason National Register Historic District</u>

- Demolition of historic fabric and contributing resources to the NHL District: removal of up to 50 feet of the northern Fort Mason Tunnel Retaining Wall, removal of historic tracks within the Fort Mason Tunnel, as well as removal of segments of historic tracks within the parking lot of Fort Mason Center. Seismic improvements to the tunnel structure itself, which is a contributing element of the Fort Mason National Register Historic District, would also remove some of the historic fabric of the interior lining of the tunnel. (Criteria of Adverse Effect I: Physical destruction of or damage to all or part of the property). The aspects of integrity that would be adversely affected by this particular action would be integrity of setting, design, workmanship, and materials, of both a portion of the

tunnel and segments of the historic tracks. Aspects of integrity that would be unaffected by these actions are location, association, and feeling.

- Introduction of new uses to the NHL District that will affect the historic viewshed, such as the alteration of existing views from within the District with new views that include: tracks, two platform/stations, overhead contact system, and signals. Specific effects to Fort Mason Building A: immediately adjacent western platform/station (Criteria of Adverse Effect IV: Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance). The aspects of integrity that would be adversely affected by this particular action would be integrity of setting, association, and feeling. Aspects of integrity that would be unaffected are location, design, workmanship, and materials.

- Introduction of new sources of noise, vibration, and light to the NHL District from streetcar operation (Criteria of Adverse Effect V. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features). For example, patrons of the Fort Mason Center and other recreational users and visitors within the District may experience greater levels of noise, vibration, and light due to streetcar operation than exist currently in this location. The aspects of integrity that would be adversely affected by this particular action would be integrity of setting, association, and feeling. Aspects of integrity that would be unaffected are location, design, workmanship, and materials.

In summary, the demolition of historic fabric and a contributing resource to the NHL District, the alteration of the historic viewshed, and the introduction of new sources of noise, vibration, and light will combine to form an adverse effect to the San Francisco Port of Embarkation, U.S. Army NHL District/Fort Mason Historic District.

<u>Indirect Effects of Noise and Vibration from Streetcar Construction and Operation</u>

A noise and vibration study was conducted as part of the draft Environmental Impact Statement (EIS) for this undertaking. In summary, the EIS found that all noise and vibration effects from construction and operation of the streetcar line would be beneath the standard U.S. DOT thresholds for these factors. As the rail line would pass within 15 feet of the Maritime Museum and the West Speaker Tower, both of which are contributors to the Aquatic Park NHL District, operational vibration levels from a structural and a nuisance standpoint were also evaluated. The vibration study concluded that operational vibration on the structural condition of the museum and tower would be below the U.S. DOT criterion of 0.12 PPV (or 90 VdB). However, the vibration study also found that the vibration nuisance (non-structural) standards would exceed the nuisance threshold by 9Vdb. Mitigation measures identified in the EIS to reduce the nuisance vibration levels below the standard threshold include reducing vehicle speed down Beach Street during nighttime hours, installation of resilient fasteners between the rails and the concrete slab, as well as floating slab technologies. These measures would

also further reduce the structural vibration effects from streetcar construction and operation. As such, the proposed undertaking would not adversely affect the historic resources in the APE from a noise and vibration standpoint.

Effects on Other National Register-Listed Properties in the APE

In addition, no adverse effects are anticipated to the remaining National Register-listed properties in the APE, including Pumping Station #2 and the San Francisco Cable Cars. A new crossing of the in-street segment of the streetcar line with the existing route of the Hyde/Powell Street Cable Car is proposed, which is within the San Francisco Cable Cars NHL. This would occur at the intersection of Hyde Street and Beach Street, and would be similar to other existing streetcar rail crossings of the historic cables. No adverse effects are anticipated to other listed properties, including the California Fruit Canners Association (Haslett) Warehouse and the Pioneer Woolen Mills & D. Ghirardelli Company.

Similarly, no adverse effects are anticipated to the California Register-eligible properties in the APE, including the Cannery, the Marina Safeway or two storage buildings on Jones Street. While new construction such as new tracks and the overhead contact system would be visible from these resources, the alteration of their historic setting is deemed to be relatively minor and somewhat typical for an urban setting such as San Francisco.

In addition, no adverse effects are anticipated at indigenous site CA-SFr-29, as this site is not located within the area proposed for ground-disturbing activities associated with the turnaround segment. Prior archeological testing for site CA-SFr-23 has not been conducted because of the dubious existence of the site based on existing documentation and the amount of disturbance and infrastructure changes that have occurred in the site locale historically. It was not considered prudent to conduct subsurface testing in this environment, and construction monitoring and treatment in accordance with post-review discoveries under 36 CFR 800.13 was considered more appropriate.

Cumulative Effects

Cumulative effects to cultural resources should consider the reasonably foreseeable actions in the APE and immediate vicinity in addition to potential effects of the proposed action. The projects identified include those which could affect cultural resources within the APE or immediate vicinity by substantially altering or impairing them, as well as ground-disturbing activities in archeologically sensitive areas.

There are a number of projects planned within or in the vicinity of the APE. Two projects at the Port of Embarkation, U.S. Army NHL District/Fort Mason Historic District, include seismic upgrades to Building E and a solar panel installation project on the roof of the Pier 2 Shed. Projects at San Francisco Maritime NHP include the Municipal Pier Rehabilitation Project, Maritime Heritage Learning Center, and Aquatic Park Bathhouse Exhibit Plan and Installation. Other projects in proximity to the APE include the San Francisco Marina Renovation Project; Fort Mason Bay Trail at Laguna

Street and Marina Boulevard; 721 Beach Street Development and the Fisherman's Wharf Public Realm Plan.

Implementation of standard mitigation measures to ensure the protection of both known and unknown cultural resources are included in the various environmental documents which have evaluated, or will evaluate, the environmental effects of each of these projects. In addition, effects to historic properties at any of the projects located on NPS-managed properties would be required to comply with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, further mitigating the intensity of the effects to cultural resources. All reasonably foreseeable projects would also have to undergo additional environmental review, thus ensuring further consideration and minimization of effects.

Projects such as the Aquatic Park Bathhouse Exhibit Plan and Installation, San Francisco Maritime NHP Municipal Pier Rehabilitation Project, and Seismic Upgrades to the Maritime Heritage Learning Center, specifically, would be subject to the provisions in the Aquatic Park Cultural Landscape Report, which is intended to minimize adverse effects to the Aquatic Park cultural landscape. Similarly, Fort Mason Bay Trail at Laguna Street and Marina Boulevard, Seismic Upgrades to Building E of the San Francisco Maritime NHP, and the Pier 2 Shed Solar Installation Project, would be subject to the Fort Mason Cultural Landscape Report, which is intended to minimize adverse effects to both the San Francisco Port of Embarkation, U.S. Army NHL District and the Fort Mason National Register Historic District. The Pier 2 Solar Panel Installation Project, specifically, was evaluated by the California SHPO and the Heritage Preservation Services Division of the National Park Service in October, 2010, which determined that this tax incentive project would comply with the *Secretary of the Interior's Standards for Rehabilitation* (see enclosure). Finally, effects to both known and unknown archeological resources as a result of any or all of these projects would be mitigated by implementing standard worker education and inadvertent discovery measures, and as required by NEPA and Section 106 of the NHPA. Therefore, based on available information, these projects in and of themselves are unlikely to have adverse effects on historic properties within the APE. However, when combined with the proposed undertaking to extend the streetcar service, which is considered on its own merits to be an adverse effect, the cumulative effect to historic properties will be adverse.

Request for Concurrence

The NPS is requesting concurrence that implementation of the proposed undertaking will constitute an adverse effect to two National Historic Landmark Districts in the APE; 1) the Aquatic Park NHL District, and 2) the San Francisco Port of Embarkation, U.S. Army NHL District/Fort Mason National Register Historic District.

Resolution of Adverse Effects and Continuing Consultation

To resolve the adverse effects to these cultural resources, the NPS intends to draft and consult on a Memorandum of Agreement (MOA) for this undertaking. Consulting parties

will include the NPS and SHPO, and may include the ACHP, the Federal Transit Authority (FTA), the City and County of San Francisco, and Ohlone representatives.

If you have any questions regarding this undertaking please contact Paul Scolari at (415) 561-4963 or email (Paul_Scolari@nps.gov) or Robbyn Jackson at (415) 561-7019 or email (Robbyn_L_Jackson@nps.gov).

Sincerely,

for

Frank Dean	Craig Kenkel
General Superintendent	Superintendent
Golden Gate National Recreation Area	San Francisco Maritime NHP

Enclosures

cc: Mr. Reid Nelson, Advisory Council on Historic Preservation
Ms. Elaine Jackson-Retondo Ph.D., National Historic Landmarks Coordinator, National Park Service – Pacific West Region
Ms. Rosemary Cambra, Chairperson, Muwekma Ohlone Indian Tribe
Mr. Tony Cerda, Chairman, Costanoan-Rumsen Carmel Tribe
Mr. Andrew Galvan, The Ohlone Indian Tribe
Ms. Louise Miranda Ramirez, Chairperson, Ohlone/Costanoan-Esselen Nation
Mr. Valentin Lopez, Chairman, Amah Mutsun Tribal Band
Mr. Patrick Orozco, Costanoan Ohlone Rumsen-Mutsun Tribe
Ms. Ann Marie Sayers, Indian Canyon Mutsun Band of Costanoan
Ms. Ramona Garibay, Representative, Trina Marie Ruano Family
Ms. Irene Zwierlein, Chairperson, Amah Mutsun Band of Ohlone Costanoan Indians
Ms. Linda Yamane
Ms. Jakki Kehl
Mr. Jonathan Cordero
Mr. Anthony Miranda
Mr. Rico Miranda
Mr. Chuck Striplen

APPENDIX D

Biological Resources

Appendix D includes Table 1, a summary of federally threatened and endangered species with potential to occur in the vicinity of the project and Table 2, additional special-status species with potential to occur in the project vicinity.

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Mammals			
Arctocephalus townsendi Guadalupe fur seal	FT/CT, FP	Coastal waters, islands, isolated, rocky haul-outs.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Balaenoptera borealis sei whale	FE/--	Temperate open seas, nearshore and offshore, from Gulf of Alaska to Baja California.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Balenoptera musculus blue whale	FE/--	Open waters, occasional inshore waters.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Balaenoptera physalus finback whale	FE/--	Open waters, occasional inshore waters.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Enhydra lutris nereis southern sea otter	FT/FP	This species occurs in nearshore marine environments from about Ano Nuevo, San Mateo County to Point Sal., Santa Barbara County. Needs canopies of giant kelp and bull kelp for rafting and feeding. Prefers rocky substrates with abundant invertebrates.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). The occurrence is located at Sausalito Point, Sausalito, which 2.2 miles north of the Golden Gate Bridge.
Eubalaena glacialis right whale	FE/--	Isolated shoreline and rocky islands from San Mateo County north.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Eumetopias jubatus steller sea-lion	FT, CH/ -	Range along the Northern Pacific Rim from Northern Japan to California, but most are found in the Gulf of Alaska and Aleutian Islands. When in the water, steller sea lions usually occupy surface and midwater coastal regions within 45km of shore. Breed and give birth in rookeries. Rookeries include rock shelves, ledges, or slopes and boulder, cobble, gravel, or sand beaches. Take refuge in haulouts. Both haulouts and rookeries are usually located on relatively remote islands where access by predators is limited.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Physeter catodon sperm whale	FE/--	Open waters, typically far from land.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).

TABLE 1
FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT

Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Reithrodontomys raviventris Salt-marsh harvest mouse	FE/CE, FP	Occurs only in the saline emergent wetlands of San Francisco Bay and its tributaries. Primary habitat is pickleweed. Builds loosely organized nests, not burrows. Requires higher areas for flood escape.	No potential to occur. The Project Area does not have saline emergent wetlands with pickleweed. There are twelve occurrences of this species within the vicinity of the project (CDFG, 2009). No occurrences are located in the San Francisco North quadrangle.
Birds			
Brachyramphus marmoratus marbled murrelet	FT/CE	Habitat is mature Douglas-fir and redwood forest within 56km (35mi) of the coast.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Charadrius alexandrinus nivosus western snowy plover	FT/SSC	Federal listing only applies to the Pacific coast population. This species occurs on sandy beaches, salt pond levees and shores of large alkali lakes. Need sandy, gravelly or friable soils for nesting.	Not likely to occur. A sandy beach is located north of the Project Area. The Project Area may be used as a corridor for dispersal. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). This occurrence is in the Hunters Point quadrangle at Bay Farm Island in San Francisco Bay, adjacent to Oakland.
Diomedea albatrus short-tailed albatross	FE/SSC	Open waters of the Pacific Ocean.	Not likely to occur. Open waters are located adjacent but not within the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Pelecanus occidentalis californicus California brown pelican	FE/DL, FP	Nests on coastal islands lacking ground predators; roost on piers, buoys, and other structures on water bodies near the coast.	Not likely to occur. Suitable habitat is located adjacent to Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Rallus longirostris obsoletus California clapper rail	FE/CE, FP	Occurs in salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	Not likely to occur. No habitat is present within or adjacent to the Project Area. There are thirteen documented occurrences of this species within the vicinity of the project (CDFG, 2009). No occurrences are located in the San Francisco North quadrangle.
Sternula antillarum browni California least tern	FE/CE, FP	Nests in colonies. Nests along the coast from San Francisco Bay south to northern Baja California. Nests on sparsely vegetated, flat substrates such as sand beaches, alkali flats, land fills, or paved areas.	Not likely to occur. Potential suitable habitat is located adjacent to the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). No occurrences are located in the San Francisco North quadrangle.

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Strix occidentalis caurina northern spotted owl	FT/SSC	Found in old growth forest with a moderate to high canopy closure; multi-layered, multi-species canopy with large overstory trees.	No potential to occur. No suitable habitat present within the Project Area. This species needs large stands of old growth forest. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Amphibians			
Ambystoma californiense California tiger salamander	FT/SSC, CCE	This species occurs in annual grasslands and grassy understory of valley-foothill hardwood habitats, need underground refuges during dry season, need vernal pools or other seasonal water sources for breeding. The known elevation range of this species extends from 3 m to 1,054 m.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). The occurrence is not located in the San Francisco North quadrangle.
Rana draytonii California red-legged frog	FT/SSC	Breed in stock ponds, pools, and slow-moving streams with emergent vegetation for escape cover and egg attachment.	No potential to occur. No habitat present in the Project Area. There are seventeen documented occurrences of this species within the vicinity of the project (CDFG, 2009). Seven of the occurrences are located in the San Francisco North quadrangle. These occurrences are located at: Lloyd Lake in Golden Gate Park, Mountain Lake in the Presidio, Lands End in the Lincoln Park Area, Stow Lake in Golden Gate Park, at the DeYoung Museum in Golden Gate Park, and at Strybing Arboretum at Golden Gate Park.
Reptiles			
Caretta caretta loggerhead turtle	FT/--	Open ocean, seldom California coast.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Chelonia mydas green sea turtle	FT/--	Warm-water bays and lagoons.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Dermochelys coriacea leatherback turtle	FE/--	Open ocean, California coast, bays and estuaries.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Lepidochelys olivacea olive ridley sea turtle	FT/--	Bay and lagoons, seldom in California.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Masticophis lateralis euryxanthus Alameda whipsnake	FT/CT	Occurs in chaparral and other scrubland habitats.	No potential to occur. No habitat present in the Project Area. There is one documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Thamnophis sirtalis tetrataenia San Francisco garter snake	FE/CE, FP	Occurs in the vicinity of freshwater marshes, ponds, and slow moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland area near water is very important for this species.	No potential to occur. No habitat present in the Project Area. There are two documented occurrences of this species within the vicinity of the project (CDFG, 2009). Neither occurrence is in the San Francisco North quadrangle.
Fish			
Acipenser medirostris green sturgeon, southern distinct population segment (DPS)	FT/SSC	Southern DPS includes Sacramento River, Pit River, McCloud River, and Feather River. Spawn in deep pools in large, turbulent, freshwater river mainstems. Use large cobble substrates, but can also range from clean sand to bedrock substrates.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Eucyclogobius newberryi tidewater goby	FE/--	This species occurs in brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found primarily in waters of coastal lagoons, estuaries, and marshes. They need fairly still but not stagnant water and high oxygen levels.	No potential to occur. No habitat present in the Project Area. There are five documented occurrences of this species within the vicinity of the project (CDFG, 2009). No occurrences are located in the San Francisco North quadrangle.
Hypomesus transpacificus Delta smelt	FT/CT	Found only from the Suisun Bay upstream through the San Joaquin-Sacramento Delta along the freshwater edge of the mixing zone (saltwater-freshwater interface), in brackish water, where the salinity is approximately 2 ppt.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Oncorhynchus kisutch Coho salmon	FE, CH/CE	Federal Listing = pops between Punta Gorda and San Lorenzo River; State Listing = pops south of Punta Gorda. Require beds of loose, silt-free, coarse gravel for spawning. Also need cover, cool water, and sufficient dissolved oxygen.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). The occurrence is not in the San Francisco North quadrangle.
Oncorhynchus mykiss irideus Steelhead, Central Valley DPS	FT, CH/CSC	Occur in the Pacific Ocean and spawn in coastal streams and rivers, over gravel beds.	No potential to occur. The Project Area is outside of the known range of this species. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
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Oncorhynchus mykiss irideus Steelhead, Central California Coast DPS	FT, CH/SSC	Occurs from Russian River, south to Soquel Creek and to, but not including, Pajaro River. Also San Francisco and San Pablo Bay Basins.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Oncorhynchus tshawytscha Chinook salmon, California Coastal ESU	FT/--	Located in rivers and streams south of the Klamath River to the Russian River, California, as well as seven artificial propagation programs: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs.	No potential to occur. The Project Area is outside of the known range of this species. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Oncorhynchus tshawytscha Chinook salmon, Central Valley spring-run ESU	FT/CT	This species is found in the Pacific Ocean and spawn in large, permanent coastal streams and rivers, over gravel beds. Spring-run Chinook salmon are primarily found in four tributaries of the Sacramento River: Butte, Big Chico, Deer, and Mill creeks. Spring-run Chinook salmon enter the Sacramento river between February and June.	No potential to occur. The Project Area is outside of the known range of this species. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Oncorhynchus tshawytscha Chinook salmon, Sacramento River winter-run ESU	FE, CH/CE	This species is found in the Pacific Ocean and spawn in large, permanent coastal streams and rivers, over gravel beds. They return to the upper Sacramento River in the winter but delay spawning until the spring and summer. Juveniles spend five to nine months in the river and Sacramento-San Joaquin Estuary before entering the ocean.	No potential to occur. The Project Area is outside of the known range of this species. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Invertebrates			
Euphydryas editha bayensis bay checkerspot butterfly	FT/--	This species is restricted to native grasslands and outcrops of serpentine soil in the vicinity of San Francisco Bay. Its primary host plant is *Plantago erecta*. Secondary host plants are *Orthocarpus densiflorus* and *O. purpurscens*.	Not likely to occur. No habitat present in the Project Area. Potential suitable habitat located in study area at Black's Point. There are four documented occurrences of this species within the vicinity of the project (CDFG, 2009). One of the occurrences is located in the San Francisco North quadrangle. This occurrence was at Twin Peaks but is now considered extirpated.
Haliotes cracherodii black abalone	FE/--	Live in tidal pools from Oregon to the southern tip of Baja California.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG 2008a).
Haliotes sorenseni white abalone	FE/--	Found in marine subtidal rocky habitats only.	No potential to occur. No habitat present in the Project Area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).

TABLE 1
FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT

Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Icaricia icarioides missionensis Mission blue butterfly	FE/--	Inhabits grasslands of the San Francisco Peninsula. Has three larval host plants: *Lupinus albifrons* (March to June), *L. varicolor*, and *L. formosus* (April to August), of which *L. albifrons* is favored.	Not likely to occur. No habitat present in the Project Area, although there is a low potential for this species to occur in the study area at Black's Point. This species is primarily known from San Mateo County, although two occurrences are located in the San Francisco North quadrangle - one is located at Twin Peaks and the other at Fort Baker (CDFG, 2009).
Incisalia mossii bayensis San Bruno elfin butterfly	FE/--	Found in coastal scrub with its preferred host plant, Pacific stonecrop (*Sedum spathulifolium*). Occurs in coastal, mountainous area with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County.	Not likely to occur. No habitat present in the Project Area, although there is potentially suitable habitat located in study area at Black's Point. There are four documented occurrences of this species within the vicinity of the project (CDFG, 2009), although none of these occurrences are in the San Francisco North quadrangle.
Speyeria callippe callippe callippe silverspot butterfly	FE/--	Found in native grasslands with its host plant *Viola pedunculata* (Bloom period: February to April).	No potential to occur. No habitat present in the Project Area. There are six documented occurrences of this species within the vicinity of the project (CDFG, 2009). One of the occurrences is located in the San Francisco North quadrangle, at Twin Peaks.
Speyeria zerene myrtleae Myrtle's silverspot butterfly	FE/--	Current populations restricted to four sites in western Marin and southwestern Sonoma counties – considered extirpated from the San Francisco peninsula. Inhabits coastal terrace prairie, coastal bluff scrub and adjacent non-native annual grassland. Host plant is the western dog violet (*Viola adunca*).	No potential to occur. Range of species outside of the project area. There are no documented occurrences of this species within the vicinity of the project (CDFG, 2009).
Plants			
Arctostaphylos hookeri ssp. *ravenii* Presidio manzanita	FE/CE	This evergreen shrub occurs in chaparral, coastal prairie, and serpentinite outcrops of coastal scrub. Prefers open, rocky serpentine slopes, 20-215 meters. It blooms from February to March.	No potential to occur. No habitat present in the Project Area. There are seven documented occurrences of this species within the vicinity of the project (CDFG, 2009). Six of the occurrences are in the San Francisco North quadrangle, of which the only extant occurrences are located in the Presidio of San Francisco.
Arctostaphylos pallida pallid manzanita	FT/--	This evergreen shrub occurs in broadleafed upland, closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub. It grows on uplifted marine terraces on siliceous shale, sandy or gravelly. May require fire. Blooms from December to March at elevations from 185 to 465 meters.	No potential to occur. The project area is lower in elevation than the elevational range of this species. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). This occurrence is not in the San Francisco North quadrangle.

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Arenaria paludicola marsh sandwort	FE/CE	This stoloniferous herb occurs in bogs and fens and freshwater swamps and marshes. It blooms from May to August at elevations from 3 to 170 meters.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). It was last seen in 1899 in the San Francisco North quadrangle at Fort Point in the Presidio Swamp, but the species is still presumed extant.
Calochortus tiburonensis Tiburon mariposa lily	FT/CT	This bulbiferous herb occurs in valley and foothill grassland; specifically on open, rocky, slopes in serpentine grasslands. It blooms from March till June at elevations from 50-150 meters.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). This occurrence is not in the San Francisco North quadrangle.
Castilleja affinis ssp. *neglecta* Tiburon paintbrush	FE/CT	This perennial herb parasitic occurs in valley and foothill grasslands on rocky serpentine sites. This species blooms from April to June at elevations from 60 to 400 meters.	No potential to occur. No habitat present in the Project Area. There are three documented occurrences of this species within the vicinity of the project (CDFG, 2009). None of the occurrences are in the San Francisco North quadrangle.
Chorizanthe robusta var. *robusta* robust spineflower	FE/--	This annual herb occurs in coastal dunes and coastal scrub on sandy terraces and bluffs or in loose sand, and in openings of cismontane woodland. Elevation: 3-300 meters. It blooms from April to September.	No potential to occur. No habitat present in the Project Area. There are three documented occurrences of this species within the vicinity of the project (CDFG, 2009). None of the occurrences are in the San Francisco North quadrangle.
Clarkia franciscana Presidio clarkia	FE/CE	This annual herb occurs in coastal scrub and valley and foothill grassland. Prefers serpentine outcrops in grassland or scrub. Elevation: 20-335 meters. It blooms from May to July.	No potential to occur. No habitat present in the Project Area. There are three documented occurrences of this species within the vicinity of the project (CDFG, 2009). All occurrences are located in the San Francisco North quadrangle, in the San Francisco Presidio.
Hesperolinon congestum Marin dwarf-flax (=western flax)	FT/CT	This annual herb occurs in chaparral and valley and foothill grassland. Occurs in serpentine barrens and in serpentine grassland and chaparral at elevations between 5 and 370 meters. It blooms from April to July.	No potential to occur. No habitat present in the Project Area. Low potential to occur. There are ten documented occurrences of this species within the vicinity of the project (CDFG, 2009). Four of these occurrences are located in the San Francisco North quadrangle. Two of the occurrences are considered extirpated. The last two occurrences are located in the Presidio, San Francisco, but one of the occurrences may possibly be extirpated.

TABLE 1 FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT			
Scientific Name **Common Name**	**Federal[1] /State**	**Preferred Habitat[2]**	**Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)**
Holocarpha macradenia Santa Cruz tarplant	FT/CE	This annual herb occurs in coastal prairie and valley and foothill grassland. Occurs in light, sandy soils or sandy clay, often with non-natives. Elevation: 10-260 meters. It blooms from June to October.	No potential to occur. No habitat present in the Project Area. There are fifteen documented occurrences of this species within the vicinity of the project (CDFG, 2009). None of the occurrences are in the San Francisco North quadrangle.
Layia carnosa beach layia	FE/CE	This annual herb occurs in coastal dunes on sparsely vegetated semi-stabilized dunes, usually behind foredunes. Elevation: 0-75 meters. Hugely reduced in range along California's north coast dunes. It blooms from March to July.	No potential to occur. No habitat present in the Project Area. There is one documented occurrence of this species within the vicinity of the project (CDFG, 2009). This occurrence which is located in the San Francisco North quadrangle is considered extirpated.
Lessingia germanorum San Francisco lessingia	FE/CE	This annual herb occurs in coastal scrub in remnant dunes and in open sandy soils relatively free of competing plants. Elevation: 20-125 meters. It blooms from August (rarely June) to November.	No potential to occur. No habitat present in the Project Area. There are five documented occurrences of this species within the vicinity of the project (CDFG, 2009). All three occurrences in the San Francisco North quadrangle are extant.
Pentachaeta bellidiflora white-rayed pentachaeta	FE/CE	This annual herb occurs in valley and foothill grassland in open dry slopes and grass area. Often on soils derived from serpentine bedrock. Elevation: 35-620 meters. It blooms from March to May.	No potential to occur. No habitat present in the Project Area. There are seven documented occurrences of this species within the vicinity of the project (CDFG, 2009). One occurrence is located in the San Francisco North quadrangle in the City of Marin.
Streptanthus niger Tiburon jewel-flower	FE/CE	This annual herb occurs in valley and foothill grassland in shallow, rocky serpentine slopes. Elevation: 30-150 meters. This species blooms from May to June.	No potential to occur. No habitat present in the Project Area. There are two documented occurrences of this species within the vicinity of the project (CDFG, 2009). None of the occurrences are in the San Francisco North quadrangle.
Suaeda californica California seablite	FE/--	This evergreen shrub occurs in marshes and swamps, specifically at the margins of coastal salt marshes. Elevation: 0-15 meters. It blooms from July to October.	No potential to occur. No habitat is present in the Project Area. There are three documented occurrences of this species within the vicinity of the project (CDFG, 2009). None of the occurrences are in the San Francisco North quadrangle.

TABLE 1
FEDERALLY THREATENED AND ENDANGERED SPECIES WITH POTENTIAL TO OCCUR IN THE VICINITY OF THE PROJECT

Scientific Name Common Name	Federal[1] /State	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Trifolium amoenum showy Indian clover	FE/--	Occurs in valley and foothill grassland and coastal bluff scrub. Historically occurred from the western edge of the Sacramento Valley in Solano County, west and north to Marin and Sonoma counties. Was considered extinct until 1993 when one locality was discovered. A second locality was discovered in 1996. The only known extant population of *T. amoenum* is that near Dillon's Beach. The other population is at the Bodega Marine Laboratory. Blooms from April to June at elevations of 5 to 560 meters.	No potential to occur. No habitat present in the Project Area. There is one documented occurrences of this species within the vicinity of the project (CDFG, 2009).

[1]Federal Categories (US Fish and Wildlife Service)
FE Federal Endangered
CT Federal Threatened CH Critical Habitat

State Categories (California Department of Fish and Game)
CE California Endangered CT California Threatened
SSC California Species of Special Concern
FP Fully Protected
CCE Candidate for listing as Endangered
DL Delisted
* Special animal

[2]Preferred Habitat information complied from the California Natural Diversity Database, California Department of Fish and Game, and California Native Plant Society websites (http://www.dfg.ca.gov/hcpb/species/search_species.shtml; http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi).

CDFG 2009 and 2010; CNPS 2010; USFWS 2010

TABLE 2

ADDITIONAL SPECIAL-STATUS SPECIES, WITH POTENTIAL TO OCCUR IN THE PROJECT VICINITY

Scientific Name Common Name	State[1]	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Birds			
Accipiter cooperii Cooper's hawk	SSC, WL	Nests in woodland habitat; chiefly in open, interrupted or marginal type. Nest sites occur mainly in riparian growths of deciduous tress, as in canyon bottoms or river flood plains. Nest sites also in live oaks.	Not likely to occur. The Project Area may be used as a corridor for dispersal. No occurrences of this species in the San Francisco North quadrangle (CDFG, 2009).
Asio flammeus short-eared owl	SSC	Meadows, grasslands, wetlands, irrigated land.	Not likely to occur. No suitable habitat present in the Project Area or adjacent to the Project Area. No occurrences of this species in the San Francisco North quadrangle.
Athene cunicularia burrowing owl	SSC	Nests and winters in open, dry annual or perennial grasslands, deserts, and sparse scrubland characterized by low growing vegetation; uses abandoned burrows of burrowing mammals for shelter and nest sites.	Not likely to occur. No suitable habitat present in the Project Area or adjacent to the Project Area. No occurrences of this species in the San Francisco North quadrangle.
Circus cyaneus northern harrier	SSC	Nests and forages in salt marsh, freshwater marsh, and grassland habitats. Nests on ground in shrubbery vegetation, usually at marsh edge. Nests are built of a large mound of sticks in wet areas.	Not likely to occur. No suitable habitat present in the Project Area or adjacent to the Project Area. No occurrences of this species in the San Francisco North quadrangle (CDFG, 2009).
Elanus leucurus white-tailed kite	FP	Nests among dense-topped trees; forages in open grasslands, meadows or marshes.	Not likely to occur. The Project Area may be used as a corridor for dispersal. No occurrences of this species in the San Francisco North quadrangle (CDFG, 2009).
Geothlypis trichas sinuosa saltmarsh common yellowthroat	SSC	Resident of the San Francisco Bay Region. Occurs in fresh and salt-water marshes. Requires thick, continuous cover down to water surface for foraging. For nesting, requires tall grass, tule patches, and willows.	Not likely to occur. No suitable habitat (fresh and saltwater marsh) present in the Project Area or adjacent to the Project Area.
Laterallus jamaicensis coturniculus, California black rail	CT, FP	Mainly inhabits salt marshes bordering larger bays. Occurs in tidal salt marsh heavily grown to pickleweed and also in freshwater and brackish marshes, all at low elevation.	Not likely to occur. No suitable habitat (salt marsh) present in the Project Area or adjacent to the Project Area.
Melospiza melodia pusillula Alameda song sparrow	SSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits *Salicornia* marshes. Nests low in *Grindelia* bushes (high enough to escape high tides) and in *Salicornia*.	Not likely to occur. No suitable habitat (salt marsh) present in the Project Area or adjacent to the Project Area.
Melospiza melodia samuelis San Pablo song sparrow	SSC	Intermixed stands of bulrush (*Scirpus* spp.), cattail (*Typha* spp.), and other emergent vegetation.	Not likely to occur. No suitable habitat (emergent vegetation) present in the Project Area or adjacent to the Project Area.

TABLE 2

ADDITIONAL SPECIAL-STATUS SPECIES, WITH POTENTIAL TO OCCUR IN THE PROJECT VICINITY

Scientific Name Common Name	State[1]	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Phalacrocorax auritus Double-crested cormorant	SSC	Coastal cliffs, offshore islands, and inland along lake margins; nests on ground or in tall trees.	Not likely to occur. The Project Area may be used as a corridor for dispersal. One of the four occurrences is in the San Francisco North quadrangle (CDFG, 2009). Nests were found along the Bay Bridge.
Riparia riparia bank swallow	CT	Riparian vegetation, vertical banks or cliffs near streams, rivers, lakes, and oceans.	Not likely to occur. Two occurrences of this species in the San Francisco North Quadrangle (CDFG, 2009) - one is an extant colony in vertical sand cliffs at Ocean Beach, and the second occurrence is extinct.
Mammals			
Antrozous pallidus pallid bat	SSC	Roosts in rock crevices, caves, mine shafts, under bridges, in buildings and tree hollows. Range extends throughout all of California.	Potential to occur. Although this species was not observed in the Fort Mason tunnel, it could use the tunnel for roosting.
Corynorhinus townsendii Townsend's big-eared bat	SSC	Roosts in open areas of caves, buildings, and bridges; extremely sensitive to disturbance. Range extends throughout all of California.	Potential to occur. The Fort Mason tunnel contains suitable nesting substrate for this species.
Lasiurus blossevillii western red bat	SSC	Roosts in foliage of trees and shrubs, often in riparian habitat. Range extends throughout all of California.	Potential to occur. This species could roosts in foliage of trees, such as the cottonwoods in the Aquatic Park.
Lasiurus cinereus hoary bat	*	Roosts in foliage of coniferous and deciduous trees. Range extends throughout California.	Potential to occur. May roost in trees in the study area.
Microtus californicus sanpabloensis San Pablo vole	SSC	Saltmarshes of San Pablo Creek, on the south shore of San Pablo Bay. Constructs burrows in soft soil. Feeds on grasses, sedges and herbs. Forms a network of runways leaving from the burrow.	No potential to occur. Species only found on south shore of San Pablo Bay.
Nyctinomops macrotis big free-tailed bat	SSC	Need high cliffs or rocky outcrops for roosting sites.	No potential to occur. No habitat present in the Project Area. No occurrences of this species in the San Francisco North quadrangle (CDFG, 2009).
Scapanus latimanus parvus Alameda Island mole	SSC	Only known from Alameda Island. Found in a variety of habitats, especially annual and perennial grasslands. Prefers moist, friable soils. Avoids flooded soils.	No potential to occur. Species only found on Alameda Island.
Sorex vagrans halicoetes salt marsh wandering shrew	SSC	Salt marshes 6-8 feet above sea level where abundant driftwood is scattered throughout pickleweed.	No potential to occur. No habitat present in the Project Area or adjacent to the Project Area. Two occurrences of this species found near San Pablo Creek and not in the San Francisco North quadrangle (CDFG, 2009).

TABLE 2 ADDITIONAL SPECIAL-STATUS SPECIES, WITH POTENTIAL TO OCCUR IN THE PROJECT VICINITY			
Scientific Name Common Name	State[1]	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Taxidea taxus American badger	SSC	Found throughout most of California, although in the coastal areas from Mendocino county south they have been drastically reduced in numbers. Principal requirements: sufficient food, friable soils, and relatively open, uncultivated ground. Grasslands, savannas, and mountain meadows near timberline are preferred. Prey primarily on burrowing rodents such as gophers, ground squirrels, and kangaroo rats. Estimated density of one badger/square mile.	No potential to occur. No habitat present in the Project Area or adjacent to the Project Area. No burrows were observed during the field reconnaissance. Three occurrences of this species in the San Francisco North quadrangle, at: Golden Gate Park, Fort Barry, and south of Lawton street and north of Moraga street, 46th Avenue (CDFG, 2009).
Zapus trinotatus orarius Point Reyes jumping mouse	SSC	Occurs primarily in bunch grass marshes on the uplands of Point Reyes. Also present in coastal scrub, grassland, and meadows. Eats mainly grass seeds with some insects and fruit taken. Builds grassy nests on ground under vegetation. Burrows in winter.	No potential to occur. No habitat present in the Project Area or adjacent to the Project Area. One of two occurrences in vicinity of the project located in San Francisco North quadrangle at Fort Barry (CDFG, 2009).
Amphibians			
Rana boylii foothill yellow-legged frog	SSC	Partly shaded, shallow streams and riffles with cobble size or larger rocky substrate.	No potential to occur. No habitat present in the study area. No occurrences of this species in the San Francisco North quadrangle (CDFG, 2009).
Reptiles			
Actinemys marmorata western pond turtle	SSC	Inhabit ponds, marshes, rivers, streams, irrigation ditches, need basking sites such as partially submerged logs or rocks, and suitable upland habit (sandy banks or grassy open fields) for egg laying. Require some slack- or slow-water aquatic habitat. Need dry nests. Nests also are typically located on a slope that is unshaded. The nesting site can be up to 402 m from the aquatic site, but the majority of nests located to date are within 200 m.	No potential to occur. No habitat present in the Project Area or adjacent to the Project Area. Two occurrences of this species in the San Francisco North quadrangle, at: Mallard Lake and Llyod Lake at Golden Gate Park (CDFG, 2009). All other occurrences outside of project area's quadrangle.
Fish			
Archoplites interruptus Sacramento perch	SSC, WL	SSC for Clear Lake population, watch list for populations outside of native range. Historically found in the sloughs, slow-moving rivers, and lakes of the Central Valley. Prefer warm water. Aquatic vegetation is essential for young to tolerate wide range of physico-chemical water conditions.	No potential to occur. No habitat present in the Project Area.
Invertebrates			
Danaus plexippus monarch butterfly	*	Eucalyptus groves, and occasionally Monterey pine and Monterey cypress groves, while migrating/overwintering (October through March).	Potential to occur. Record of this species overwintering in trees at Fort Mason in 1990 (CDFG, 2010).
Plants			

TABLE 2

ADDITIONAL SPECIAL-STATUS SPECIES, WITH POTENTIAL TO OCCUR IN THE PROJECT VICINITY

Scientific Name Common Name	State[1]	Preferred Habitat[2]	Likelihood That Species May Occur In the Project Area (Potential to occur, Not likely to occur, No potential to occur)
Arctostaphylos imbricata San Bruno Mountain manzanita	CE	This species occurs in maritime chaparral, coastal scrub, north-facing slopes.	Not likely to occur. No CNDDB records in the study area (CDFG, 2010), and all records are from San Bruno Mountain.
Arctostaphylos pacifica Pacific manzanita	CE	This species occurs in maritime chaparral and coastal scrub habitat.	Not likely to occur. No CNDDB records in the study area (CDFG, 2010), and currently only known to occur in a small area on a sandstone ridge near the summit of San Bruno Mountain.
Plagiobothrys diffusus San Francisco popcorn-flower	CE	This species occurs in coastal prairie and valley and foothill grassland, in areas with marine influence.	No potential to occur. No habitat is present for this species in the study area. This species is presumed extirpated from San Francisco, and known locations are generally south and coastal.
Sanicula maritima adobe sanicle	R	Chaparral, coastal prairie, meadows and seeps, and valley and foothill grassland/clay, serpentinite. Elevation: 30-240 meters. Blooms from February to May.	Unlikely to occur. No suitable habitat is present for this species in the Project Area or study area, and there are no recent CNDDB records for this species here (CDFG, 2010).

[1]California Endangered Species Act

CE Endangered
CT Threatened
SSC Species of Special Concern
FP Fully Protected
WL Watch List
R Rare
CCE Candidate for listing as Endangered
* Special animal

[2] Preferred Habitat information complied from the California Natural Diversity Database, California Department of Fish and Game, and California Native Plant Society websites (http://www.dfg.ca.gov/hcpb/species/search_species.shtml; http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi).

CDFG 2009 and 2010; CNPS 2010; USFWS 2010

Additional Special-Status Plants. Plant species that are threatened, endangered, or rare under the California Endangered Species Act are listed in Table 2. During the records search, several additional special-status species were identified as having occurred in the vicinity of the Project area at one time. These species are not threatened or endangered under federal or state endangered species acts, but are considered rare, threatened, or endangered in California and elsewhere by CNPS (a CNPS list 1B species), or rare, threatened, or endangered in California but more common elsewhere (CNPS list 2 species). Based on the current habitat conditions and the known range of these plants, none of these plant species have potential to occur within the Project area:

- Napa false indigo (*Amorpha californica* var. *napensis*)
- Bent-flowered fiddleneck (*Amsinckia lunaris*)
- Waldo rock cress (*Arabis aculeolata*)
- Franciscan manzanita (*Arctostaphylos hookeri* ssp. *franciscana*)
- Mt. Tamalpais manzanita (*Arctostaphylos hookeri* ssp. *montana*)
- Montara manzanita (*Arctostaphylos montaraensis*)
- Marin manzanita (*Arctostaphylos virgata*)
- Alkali milk-vetch (*Astragalus tener* var. *tener*)
- San Joaquin spearscale (*Atriplex joaquiniana*)
- Small groundcone (*Boschniakia hookeri*)
- Round-leaved filaree (*California macrophylla*)
- Tiburon mariposa lily (*Calochortus tiburonensis*)
- Coastal bluff morning-glory (*Calystegia purpurata* ssp. *saxicola*)
- Bristly sedge (*Carex comosa*)
- Pappose tarplant (*Centromadia parryi* ssp. *parryi*)
- San Francisco Bay spineflower (*Chorizanthe cuspidata* var. *cuspidata*)
- Sonoma spineflower (*Chorizanthe valida*)
- Franciscan thistle (*Cirsium andrewsii*)
- Mt. Tamalpais thistle (*Cirsium hydrophilum* var. *vaseyi*)
- Compact cobwebby thistle (*Cirsium occidentale* var. *compactum*)
- Round-head Chinese houses (*Collinsia corymbosa*)
- San Francisco collinsia (*Collinsia multicolor*)
- Point Reyes bird's-beak (*Cordylanthus maritimus* ssp. *palustris*)
- Western leatherwood (*Dirca occidentalis*)
- Marsh horsetail (*Equisetum palustre*)
- Tiburon buckwheat (*Eriogonum luteolum* var. *caninum*)

- Minute pocket-moss (*Fissidens pauperculus*)
- Marin checker lily (*Fritillaris lanceolata* var. *tristulis*)
- Fragrant fritillary (*Fritillaria liliacea*)
- Blue coast gilia (*Gilia capitata* ssp. *chamissonis*)
- Woolly-head gilia (*Gilia capitata* ssp. *tomentosa*)
- Dark-eyed gilia (*Gilia millefoliata*)
- San Francisco gumplant (*Grindelia hirsutula* var. *maritima*)
- Diablo helianthella (*Helianthella castanea*)
- Seaside tarplant (*Hemizonia cong*esta ssp. *congesta*)
- Short-leaved evax (*Hesperevax sparsiflora* var. *brevifolia*)
- Loma Prieta hoita (*Hoita strobilina*)
- Kellogg's horkelia (*Horkelia cuneata* ssp. *sericea*)
- Thin-lobed horkelia (*Horkelia tenuiloba*)
- Rose leptosiphon (*Leptosiphon rosaceus*)
- Woolly-headed lessingia (*Lessingia hololeuca*)
- Tamalpais lessingia (*Lessingia micradenia* var. *micradenia*)
- Arcuate bush mallow (*Malacothamnus arcuatus*)
- Oregon meconella (*Meconella oregano)*
- Mt. Diablo cottonweed (*Micropus amphibolus*)
- Marsh microseris (*Microseris paludosa*)
- Robust monardella (*Monardella villosa* ssp. *globosa*)
- Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*)
- Marin County navarretia (*Navarretia rosulata*)
- Choris's popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*)
- Hairless popcorn-flower (*Plagiobothrys glaber*)
- North Coast semaphore grass (*Pleuropogon hooverianus*)
- Oregon polemonium (*Polemonium carneum*)
- Marin knotweed (*Polygonum marinense*)
- Tamalpais oak (*Quercus parvula* var. *tamalpaisensis*)
- Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *rhizomata*)
- San Francisco campion (*Silene verecunda* ssp. *verecunda*)
- Santa Cruz microseris (*Stebbinsoseris decipiens*)
- Most beautiful jewel-flower (*Streptanthus albidus* ssp. peramoenus)
- Tamalpais jewel-flower (*Streptanthus batrachopus*)

- Mount Tamalpais jewel-flower (*Streptanthus glandulosus* ssp. *pulchellus*)
- Santa Ynez false lupine (*Thermopsis macrophylla*)
- Saline clover (*Trifolium depauperatum* var. *hydrophilum*)
- San Francisco owl's clover (*Triphysaria floribunda*)
- Coastal triquetrella (*Triquetrella californica*)
- Monterey cypress (*Cupressus macrocarpa*)
- Monterey pine (*Pinus radiata*)

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APPENDIX E

Air Quality

Appendix E presents air quality data for the 2010 Construction Greenhouse Gas Emissions and the Road Construction Emissions Model, Version 6.3.2.

Historic Streetcar Extension

EMISSIONS in tons

2012 Construction GHG Emissions	**CO2**	**CH4**	**N2O**
	471 (from ROADMOD)		

From CCAR GPR 3.1 (2009) Table C-6

Diesel emission of CO2	10.15 kg CO2/gal
	0.00058 kg CH4/gal
	0.00026 kg N2O/gal

So for Diesel Equipment Sources: CH4 emission = 5.71E-05 percent of CO2 Emissions

N2O emissions = 2.56E-05 percent of CO2 Emissions

	CO2	**CH4**	**N2O**	**Total GHG**
Total Construction emissions in tons =	471.00	0.03	0.01	471.04
Total construction emissions as eCO2 in tons =	471.00	0.57	3.74	475.31
Total construction Emissions as eCO2 on Metric tons =	**427.28**	**0.51**	**3.39**	**431.19**

Road Construction Emissions Model, Version 6.3.2

Emission Estimates for -> Extension of Historic Streetcar				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM10 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	PM2.5 (lbs/day)	CO2 (lbs/day)
Grubbing/Land Clearing	4.6	20.1	35.8	14.6	1.6	13.0	4.2	1.5	2.7	3,424.2
Grading/Excavation	7.2	44.6	53.8	15.6	2.6	13.0	5.0	2.3	2.7	5,977.7
Drainage/Utilities/Sub-Grade	4.6	18.5	32.8	14.8	1.8	13.0	4.4	1.7	2.7	3,194.9
Paving	3.2	10.9	15.5	1.4	1.4	-	1.3	1.3	-	1,415.6
Maximum (pounds/day)	7.2	44.6	53.8	15.6	2.6	13.0	5.0	2.3	2.7	5,977.7
Total (tons/construction project)	0.7	3.6	4.9	1.5	0.3	1.3	0.5	0.2	0.3	519.4

Notes: Project Start Year -> 2011
Project Length (months) -> 12
Total Project Area (acres) -> 5
Maximum Area Disturbed/Day (acres) -> 1
Total Soil Imported/Exported (yd^3/day)-> 340

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sum of exhaust and fugitive dust emissions shown in columns K and L.

Emission Estimates for -> Extension of Historic Streetcar				Total	Exhaust	Fugitive Dust	Total	Exhaust	Fugitive Dust	
Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM10 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	PM2.5 (kgs/day)	CO2 (kgs/day)
Grubbing/Land Clearing	2.1	9.1	16.3	6.6	0.7	5.9	1.9	0.7	1.2	1,556.5
Grading/Excavation	3.3	20.3	24.5	7.1	1.2	5.9	2.3	1.1	1.2	2,717.2
Drainage/Utilities/Sub-Grade	2.1	8.4	14.9	6.7	0.8	5.9	2.0	0.8	1.2	1,452.2
Paving	1.4	4.9	7.0	0.6	0.6	-	0.6	0.6	-	643.5
Maximum (kilograms/day)	3.3	20.3	24.5	7.1	1.2	5.9	2.3	1.1	1.2	2,717.2
Total (megagrams/construction project)	0.6	3.3	4.4	1.4	0.2	1.2	0.5	0.2	0.2	471.1

Notes: Project Start Year -> 2011
Project Length (months) -> 12
Total Project Area (hectares) -> 2
Maximum Area Disturbed/Day (hectares) -> 1
Total Soil Imported/Exported (meters ^{3}/day)-> 260

PM10 and PM2.5 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I. Total PM2.5 emissions shown in Column J are the sume of exhaust and fugitive dust emissions shown in columns K and L.

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APPENDIX F

Noise

Appendix F includes the railway noise model; determination of construction noise at nearest receptors; logarithmic average of 12 streetcar noise readings on straightaway; and the noise monitoring report.

Railway Noise Model

Railway Noise Model

Computation of noise exposure at 50 feet for Fixed Guideway Assessment - Turn

Project: Extension of Historic Streetcars (F-line), San Francisco CA

Date: 8/2/2010

Locomotives:

Hourly Leq at 50 feet = SELref + 10log(Nsource) + Klog(S/50) + 10log(V) -35.6

Where:

		Input Values	Source
SELref = reference noise level at 50 feet	SEL ref =	87.8	Measurements
Nsource = average number of locomotives per train	Ns =	1	FTA - single car
K = +10 for electric trains	K =	1	Using measurement data, no correction needed)
S = train speed in miles per hour	S =	50	Using measurement data, no correction needed)
V = Average houly volume of train traffic in trains per hour	V =	6	based on 10 minute headways

	Output Values
Hourly Leq at 50 ft =	59.98
Daytime Leq at 50 feet =	59.98
Nightime Leq at 50 feet =	56.97

Vday = 6 (90 headways/15 hours)
Vnight = 3 (18 Headways/9 hours)

Ldn = 10log((15)x10^(Leq(day)/10) + (9) x 10^Leq(night)=10/10) -13.8

Ldn = 63.96303

Determination of Construction Noise at Nearest Receptors

Fort Mason Street Car - Determination of Construction Noise at Nearest Receptors

Ns=10 x LOG10((10^(N1/10))+(10^(N2/10)))

where;

- Ns= summation of noise levels
- N1= noise level 1= 89.6 dBA — Source #1 Concrete Saw
- N2= noise level 2= 90.3 dBA — Source #2 Mounted Impact Hammer
- Ns= 93.0 dBA

Ni = No - 30(log Di/Do) (Bolt, Beranek, and Newman, 1971)

where:

- Ni= attenuated noise level of interest
- No= reference noise level
- Di= distance to receptor
- Do= reference distance

Receptor #1 = 50 ft			Receptor # 2 - 80 feet		Receptor # 3 - 100 feet		Receptor # 4 - 250 feet		Receptor # 5 - 400 feet	
No=	93.0	dBA	No=	93.0	No=	93.0	No=	93.0	No=	93.0
Di=	50	ft	Di=	80	Di=	100	Di=	250	Di=	400
Do=	50	ft	Do=	50	Do=	50	Do=	50	Do=	50
Ni=	92.97	dBA	Ni=	88.89	Ni=	86.95	Ni=	78.99	Ni=	74.91

Logarithmic Average of 12 Streetcar Noise Readings on Straightaway

Logarithmic Average of 12 Streetcar readings - Straightaway

SEL=	80.7	94.1	96.3	87.1	83.7	88.4	83.2	85.2	78.1	82.4	88.1	82.1
	1.17E+08	2.57E+09	4.27E+09	5.13E+08	2.34E+08	6.92E+08	2.09E+08	3.31E+08	64565423	1.74E+08	6.46E+08	1.62E+08
	80.7	80	80	87.1	83.7	88.4	83.2	85.2	78.1	82.4	88.1	82.1

Averaging 89.19907

85.78 Arithmentic average for comparison

B7 cell needs to have the referenced to how many to average (e.g. B4+C4+D4) and divide by N (the number of sources to be averaged)

Logarithmic Average of 14 Streetcar readings - Turn

71.2	80.1	98.9	79.1	75	75.5	76.1	74.1	76.3	74.2	77.2	84.9	81.7	83.2	77.7
13182567	1.02E+08	7.76E+09	81283052	31622777	35481339	40738028	25703958	42657952	26302680	52480746	3.09E+08	1.48E+08	2.09E+08	58884366
71.2	80	80	79.1	75	75.5	76.1	74.1	76.3	74.2	77.2	84.9	81.7	83.2	77.7

Averaging 87.75198

Noise Monitoring Report

Noise Monitoring Report - SF Sreetcar F-line

8/2/2010

Location 1: SE corner of Taylor and Beach Street 50 ft from rail center

Time:	Car Data	Lmax	SEL	Lmax at 100	Lmax at 200
10:35	Car 1056	Not Read	80.7		
10:42	Car 1859	Not Read	94.1		
10:52	Car 1818	Not Read	96.3		
10:58	Car 1057	82.4	87.1		
11:07	PCC - Number missed	77.4	83.7		
11:14	Car 1076	83.5	88.4		
11:17	Car 1075	77.1	83.2		
11:33	Car 1077	78.7	85.2		
11:35	Car 1010	69.6	78.1		
11:47	Car 1059	75.5	82.4		
11:57	Car 952	80.1	88.1		
12:00	Car 1060	75.8	82.1		
Location 2:	SW corner of Jones and Beach Streets				
1:01	Picture	61.1	71.2	58.1	55.1
1:24	Car 1062	71.9	80.1	68.9	65.9
1:37	Car 952 (Wheel Squeel)	94.9	98.9	91.9	88.9
1:41	Car 1077	69.9	79.1	66.9	63.9
1:44	Car 1010	68.1	75	65.1	62.1
1:47	Car1059	68.5	75.5	65.5	62.5
1:55	Car 1060	69	76.1	66.0	63.0
2:02	Car 1075	66.6	74.1	63.6	60.6
2:30	Car 1007	69	76.3	66.0	63.0
2:32	Car 1051	66.7	74.2	63.7	60.7
2:36	Car 1056	70.8	77.2	67.8	64.8
2:42	Car 162	76.5	84.9	73.5	70.5
2:45	Car 1859	78.8	81.7	75.8	72.8
2:50	Car 1818	77.6	83.2	74.6	71.6
2:51	Car 1057	69.8	77.7	66.8	63.8

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APPENDIX G

Impairment Determination

Appendix G contains the NPS Management Policies' prohibition on impairment of park resources and values followed by an impairment statement for the resources analyzed under the preferred alternative.

IMPAIRMENT DETERMINATION

The Prohibition on Impairment of Park Resources and Values

NPS Management Policies 2006, Section 1.4.4, explains the prohibition on impairment of park resources and values:

> While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the Nation Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

What is Impairment?

NPS *Management Policies 2006*, Section 1.4.5, *What Constitutes Impairment of Park Resources and Values*, and Section 1.4.6, *What Constitutes Park Resources and Values*, provide an explanation of impairment.

> Impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.

Section 1.4.5 of Management Policies 2006 states:

An impact to any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Per Section 1.4.6 of *Management Policies 2006*, park resources and values that may be impaired include:

- the park's scenery, natural and historic objects, and wildlife, and the processes and condition that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structure, and objects; museum collections; and native plants and animals;

- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;

- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and

- any additional attributes encompassed by the specific values and purposes for which the park was established.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park, but this would not be a violation of the Organic Act unless the NPS was in some way responsible for the action.

How is an Impairment Determination Made?

Section 1.4.7 of *Management Policies 2006* states, "[i]n making a determination of whether there would be an impairment, an NPS decision maker must use his or her professional judgment. This means that the decision-maker must consider any environmental assessments or environmental impact statements required by the National Environmental Policy Act of 1969 (NEPA); consultations required under Section 106 of the National Historic Preservation Act (NHPA); relevant scientific and scholarly studies; advice or insights offered by subject matter experts and others who have relevant knowledge or experience; and the results of civic engagement and public involvement activities relating to the decision.

Management Policies 2006 further define "professional judgment" as "a decision or opinion that is shaped by study and analysis and full consideration of all the relevant facts, and that takes into account the decision-maker's education, training, and experience; advice or insights offered by subject matter experts and others who have relevant knowledge and experience; good science and scholarship; and, whenever appropriate, the results of civic engagement and public involvement activities relating to the decision.

Impairment Determination for the Preferred Alternative

This determination on impairment has been prepared for the preferred alternative described in Chapter 2 of this DEIS. An impairment determination is not made for all resource impact topics analyzed for the preferred alternative. An impairment determination is not made for land use, socioeconomics, transportation and circulation, recreation and visitor use, public health and safety, and public services and utilities because impairment findings relate back to park resources and values, and these impact areas are not generally considered to be park resources or values according to the Organic Act, and cannot be impaired in the same way that an action can impair park resources and values.

Air Quality

Short-term adverse air quality impacts would result from daily maximum construction activities. With implementation of BAAQMD best management practices for the control of construction-generated emissions as well as implementation of one of the three excavation/fill material mitigation measures, short-term air quality impacts would be minor to moderate and adverse.

Long-term air quality impacts would be associated with potential minor decreases in vehicle trip generation into the Parks and associated decreases in intersection traffic volumes. Therefore, the preferred alternative results in negligible to minor beneficial operational impacts to both regional and local air quality as well as greenhouse gas emissions. There would be no impairment to the park's resources or values related to air quality and greenhouse gas emissions because there would be no long-term changes to the air quality in the parks as a result of the implementation of this project.

Noise and Vibration

The natural soundscape is viewed as a resource and value to be appreciated by visitors. Many park visitors have an expectation of seeing, hearing and experiencing phenomena associated with a specific natural environment. The Fort Mason Center and SF Maritime NHP are located in an urbanized area of San Francisco where the natural soundscape elements such as sea lion calls and tidal motions of the bay are generally overcome by existing human-generated noise from motor vehicle traffic and human voices in this densely populated and visited area, particularly during daytime hours.

While there would be major adverse noise and vibration impacts related to construction and operation of the proposed action, the only receptor within Park jurisdiction to potentially experience a major adverse impact would be the Maritime Museum. Implementation of mitigation would lessen the adverse operational annoyance impact from vibration, however the impact would remain adverse for residential uses and hotels where sleeping occurs. There is also potential for beneficial noise reduction impacts that would result from the reduction in motor vehicle trips. There would be no impairment to the National Park Service resources or values because the annoyance impact of noise and vibration would not harm the integrity of the park resources and the long-term impacts would be mitigated.

Cultural Resources

Between the two national parks, there are eight historic properties in the project area including three National Historic Landmarks. The changes proposed in the preferred alternative, as a whole, would represent a long-term, moderate, adverse impact to historic resources, including those listed in the National Register of Historic Places. Particularly, the proposed demolition or alteration of individual resources such as the stone retaining wall at Aquatic Park, the removal of portions of the retaining walls at the Fort Mason Tunnel west portal, and the partial removal of railroad tracks at Lower Fort Mason would impact these sensitive, character-defining features of both the San Francisco Maritime National Historical Park/Aquatic Park, and the San Francisco Port of Embarkation/Fort Mason NHLs. The preferred alternative would also introduce new incompatible uses that would affect the historic viewsheds of the NHLs, including new tracks, platform/stations, overhead contact system, signals, and lights. Because proposed mitigation measures would reduce these adverse impacts and because there would still be ample opportunities for the enjoyment of these resources, this project would not result in an impairment in the cultural resources and values.

Visual and Aesthetic Resources

The visual character of the study area reflects the built-up features of San Francisco's urban landscape surrounding acres of open space, including parklands and shorelines owned and operated by the National Park Service and the City of San Francisco. Sweeping views of the Bay, Alcatraz, Marin County, and Golden Gate Bridge are ever-present and constitute the spectacular nature of viewsheds cherished by residents and visitors of this part of San Francisco. Historic viewsheds in the project area are present in upper Fort Mason and within the National Historic Landmark Districts.

The preferred alternative changes the visual landscape along the alignment of the project, but the pre-project landscape would not be altered beyond recognition, and the integrity of the parks resources and values would not be diminished, therefore there would be no impairment of the park's visual or aesthetic resources.

Night Sky Visibility and Light Pollution

Nighttime lighting in this highly urban environment is dominated by the presence of extensive street, parking lot lighting, security lighting, public lighting, vehicular headlights, the illuminated Ghirardelli sign above Ghirardelli Square, and well-lit shops and restaurants of the popular fisherman's wharf tourist area. The parking lot of the Fort Mason Center is well lit during evening hours. Most of these lighting sources are in use from sunset to sunrise. As is characteristic of highly urbanized areas, the glare of artificial outdoor and indoor lighting has nearly completely obscured the stars and other astronomical phenomenon in the night sky.

While the project will require additional lighting, the ability to use light shielding fixtures and the fact that facilities would be placed in an already light environment would not appreciably alter important landscape characteristics, and view intactness would change only slightly, so as to not negatively affect

scenic quality, thus the integrity of the park's resources and values related to night sky visibility would not be impaired.

Geology, Soils, and Seismicity

Under the preferred alternative, conditions with respect to geologic resources, geologic hazards, and soils in the project area would result in minor effects. The existing condition of the Fort Mason Tunnel would be improved. The installation and operation of a street car, with adherence to modern building codes and the CBC, would not substantially increase risks to the public from seismic or geologic hazards. The streetcar line would be built on low grades and thus risks from landslides or slope stability are generally minor. Because of the low risks resulting from the implementation of preferred alterative, there would be no impairment to the resources and values of the geological resources in the parks.

Biological Resources

All of the Project area is contained within existing paved roadways, except for a small portion of undeveloped, landscaped habitat that the streetcar would traverse, in the Aquatic Park east of Van Ness Avenue. The study area is also predominantly developed, but there are undeveloped areas in Upper Fort Mason and Aquatic Park. The Project area is predominantly developed and lacks suitable habitat for federal-status wildlife species and does not have appropriate habitat for any federal-status plant species. After implementation of mitigation measures requiring preconstruction nesting bird surveys and roosting bat surveys, construction and operation impacts would have negligible impacts on biological resources, and the overall vegetation and wildlife habitat in the study area would remain the same. Because of the negligible impacts to biological resources during the construction and operation of the project, there would be no impairment of the parks' biological resources and values.

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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